RADIO NEWS

25 Cents MAY

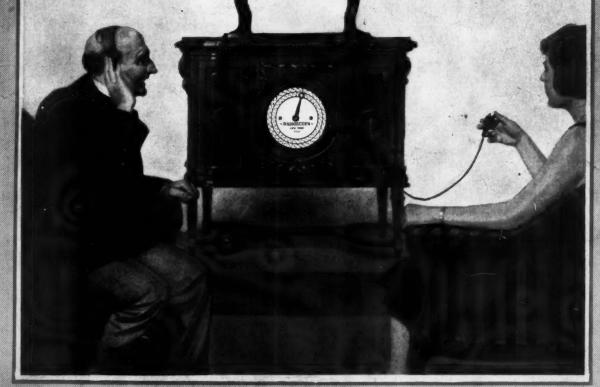
Over 200

TKG540* R118

Edited by HUGO GERNSBACK

RADIO IN 1935 SEE PAGE 2050





RADIO'S GREATEST MAGAZINE

SCIENCE and INVENTION

THE EXPERIMENTER

MOTOR CAMPER & TOURIST



Another Famous TOWER



the world being 792 feet high, containing 60 stories, and having an estimated weight of 206,000,000 pounds.

THE TOWER MFG. CORPORATION

98 BROOKLINE AVE. Dept. U BOSTON, N

Worlds Greatest Loud Speaker Value

Published by EXPERIMENTER PUBLISHING COMPANY, INC Publishers of "Radio News." "Science and Invention."
"The Experimenter" and "Motor Camper & Tourist." Editorial and General Offices: 53 Park Pl., New York City GERNSBACK, President. S. GERNSBACK, Treasurer R. W. DEMOTT, Secretary. MEMBER: AUDIT BUREAU OF CIRCULATIONS

VOLUME 6

CONTENTS MAY. 1925

NUMBER 11

In Our Next Issue

An Entirely New Development in Radio Receivers.

A new idea by means of which it is possible for broadcast listeners to get all low wave stations from 200 to 300 meters and the higher waves from 300 to 600 meters without crowding on the dial, and without the present interference.

A Symposium on the Theories of Fading.

By Leon L. Adelman A discussion of all the theories so far put forward in explanation of one of radio's greatest enig-mas. The article also takes into consideration all the theories regarding the propagation of radio waves.

Design Your Own Low Loss Coils.

By Sylvan Harris Sylvan Harris tells the readers RADIO NEWS how to design and make their own low loss coils for radio receivers. No longer do you have to take the word of the salesman. Design your own inductances and know they are the most efficient possible.

A New Non-Radiating Regenera-New Non-tive Receiver. By Sander Stern

A new application of an old principle allows the use of radio's most efficient principle without the accompanying annoyance to the neighbors.

In This Issue

Editorial By H. Gernsback 2043 "Black Listening is Theft"
By H. Giesecke 2044 Radio and the Copyright
Problem
By Hiram L. Jome 2046 Don't Believe It By Jay Hollander 2047

Radio in 1935 By H. Gernsback 2050 International Radio 2052 The Strong Arm Circuit By Robert Francis Smith 2053 The Inventions of Reginald A. Fessenden

..... 2054 Lessons in Esperanto
By James D. Sayers 2056

KFI Super-Power Station of the West 2064
The Month in Radio 2065

Hotel Furnishes Radio for Its Guests By C. Brown Hyatt 2068

Radio as a Life Work.... 2072 Radio in the Cave Disaster
By C. W. Williams 2073

A Five-Meter Transmitter By W. B. Arvin 2074 The Most Novel Super-Heterodyne By D, C. Wilkerson 2076

The Most Selective Set By Alfred R. Marcy 2078

Noiseless Intermediate Amplifier By G. C. B. Rowe 2079

Some Effects of Resistance in Radio Tuning Circuits By Sylvan Harris 2080 An Efficient Crystal Detec-

tor By R. Hutchison 2082 Oscillations and How They

Are Overcome By Leon L. Adelman 2083 American Scientists Strive for Radio Perfection... 2085

Overhauling Your Radio Set By A. P. Peck 2086

Set By Fair-Sex Inventor
By Gail Savage 2089 New Miniature Radio Phones Are Worn in Ear By C. A. Oldroyd 2090

Television for Amateurs By S. R. Winters 2091 With the Amateurs—Hamitorial 2092

Novel Coil Winding Ma-chine 2101

Specialize!
By Howard S. Pyle 2102 Correspondence from Readers 2106

New Radio Patents Compiled by G, F. Selleck, Jr. 2107 I-Want-to-Know 2108

Cails Heard 2120 Index to Advertisers......2028

RADIO NEWS is published on the 10th of each preceding month. There are 12 numbers per year. Subscription price is \$2.50 a year in U. S. and possessions. Canada and foreign countries, \$3.00 a year. U. S. Colon as well as U. S. Stamps sceepied in Orogin colon or the control of the colon of th

New York City General Advertising Dept. 53 Park Place

Western Advertising Representative Finuean & McClure 720 Case St., Chicago, III.

RADIO NEWS is for sale at all newsstands in the United States and Canada, also at The International News Co., Ltd., Bream's Building, London, E. C. 4, Begland, and at Brentanc's, 37 Avenue de l'Opera, Paris, Houve To SUBSCHIE FOR RADIO NEWS. Send your name, address and remittance to Experimenter Publishing Co., 35 Park Place, New York. Mention the name of the mazzine you are ordering. We also publish SCIENCE AND INVENTION, the EXPERIMENTER and MOTOR CAMPER & TOURIST, Write clearly. The Company of the Campen of the magnetic policy of the Campen of the magnetic policy of the Campen of the Campen of the Magnetic Parish of the Campen of the Magnetic Parish of the Campen of the Campen





Why Tuning is So Easy with the Grebe

S-L-F (straight line frequency) Condensers—exclusively Grebe—make unnecessary the crowding of short-wave stations to the lower dial numbers.

On the Grebe dial all stations have equal spacing. There is as much leeway in tuning-in a short as a long-wave station. Sharp tuning is quick, easy and certain.

Each station is found on the same settings on all dials.

With other exclusive Grebe features—such as *Binocular Coils* and *Volume Control*—the Synchrophase presents the very latest in radio receiver development.

Unlike sets made of assembled parts, every detail of the Synchrophase is designed and built in our factory in order that we may control the quality and workmanship. For this reason all parts co-ordinate perfectly and make possible the unsurpassed performance of the Synchrophase.

The cabinet is beautifully designed and built of solid-mahogany, highly polished and with delicately emboased gold escutcheons.

Ask your dealer for a demonstration

A. H. Grebe & Co., Inc. Van Wyck Blyd., Richmond Hill, N. Y.

Western Branch: 443 So. San Pedro Street, Los Angeles, Cal.



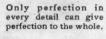
CREBE SYNCHARIAN -TRADE MARK-



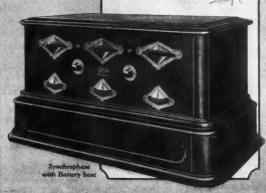
TRADE MARK

All Grebe apparatus is covered by patents granted and pending.

This Company owns and operates Station WAHG



Loctor The



INDEX TO ADVERTISERS

D	Page	Page	Page
A	D Page	J Page	Page Radio Dealers' Purchasing Co. 2178
Acme Apparatus Co 2125	D. X. Instrument Co 2112	Jones, Howard B 2181	Radiogem Corp., The 2157
Adams-Morgan Co., Inc 2191	Daven Radio Corp 2185	Jones Radio Mfg. Co., Jos. W. 2118	Radio Industries Corp2034-2035
Adbro Mfg. Co 2181	Dayton Fan & Motor Co., The		Radio Institute of America 2114
Adirondack Mt. Service Co 2181	De Jur Products Co 2156	K	Radio Parts Co 2146
Alden Míg. Co 2132	Dey's Radio Service 2177	V Floatric Co 2122	Radio Printers
All-American Radio Corp 2117	Diamond Electric Specialties	K Electric Co	Radio Specialty Co. 2038-2039-2159
	Corp	Kellogg Switchboard & Sup-	Radio Tube Exchange 2182
	Dubilier Condenser & Radio	ply Co 2188	Radio Units, Inc 2162
Allen-Bradley Co 2192 Aluminum Products Co 2178	Corp 2173	Kilbourne & Clark Mfg. Co. 2120	Randolph & Co 2174
Ambassador Sales Co 2148	Duplex Condenser & Radio Corp	Kimley Electric Co 2146 Klosner Radio Corp 2140	Reed, Al 2174
American Bosch Magneto	Corp	Riosier Radio Corp 2140	Reichmann Co
Corp 2187	Durkee-Thomas Products Co. 2144		Roice Tube Co 2187
American Electric Co 2181		L	Rola Co., The 2119
American Hard Rubber Co 2161 American Radio Mfg. Co 2118		Lancaster & Allwine 2185	
Amplion Corporation of	E	Liberty Transformer Co., Inc. 2182	S
America 2138	73 7 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	Lincoln Mfg. Co., The 2156	Saturn Mig. & Sales Co.,
Amsco Prod'ts, Inc. 2162-2169-2187	E. I. Co	Los Angeles Sales Co., Inc. 2166	Inc., The 2118
Andrews Radio Co 2122	E-Z Toon Radio Co 2154 Eagle Radio Co 2120		Schneitter Radio Co 2126
Antennaphone Co 2156	Eastern Electric Co 2177	M	Service Battery Co 2179
Apex Electric Mfg. Co 2118	Eaton, Geo 2174	M & M Co., The 2148	Shamrock Mfg. Co 2167
Arrow Battery Co 2166 Atlantic & Pacific Radio	Electrical Research Labs 2129	Manhattan Radio Co 2167	Shipman-Ward Mfg. Co 2187
Corp	Electric Service Supplies Co. 2167	Marshall Electric Co 2178	Silver-Marshall, Inc 2134
Atwater Kent Mig. Co 2133	Electric Specialty Co 2132	Marshall-Gerkin Co 2174	Singer Radio Corp 2182
Automatic Electrical Devices	Electric Storage Battery Co. 2131 Electro Importing Co 2168	Martin-Copeland Co 2179	Southern Toy Co., Inc., The 2185
Co., The 2136	Electro Thermal Co 2166	Mastertone Radio Co 2154	Spaulding Fibre Co., Inc 2174
	Elgin Radio Supply Co 2126	Maxwell Radio Co 2118 Mazda Radio Mfg. Co., The 2158	Standard Radio Corp 2124
В	Elite Stationery Co 2170	Michigan State Automobile	Standard Radio Corp., The Inside Back Cover
Bakelite Corp 2144	Erie Fixture Supply Co 2174	School 2152	Starrett Mfg. Co 2152
Baldwin-Pacific & Co, 2191	Eureka Batery Co., Inc 2162	Midwest Radio Co 2120	Steinite Laboratories 2136
Barawik Co., The 2143	Evans & Co., Victor J 2187	Mozart-Grand Co., The 2166 Multiple Electric Products	Sterling Mfg. Co., The 2186
Barkelew Electric Mfg. Co., The	Experimenters' Information Service, Inc2171-2177	Co., Inc 2144	Stransky, J. A 2150
Biltmore Radio Co., The 2149		Murdock Co., Wm. J 2127	Stromberg-Carlson Tel. Mfg.
Black Brothers, Inc 2186		Music Master Corp 2120	
Bluebird Tube Co 2174	P	Mydar Radio Co 2166	T
Bodine Electric Co 2169			
Boice, W. B. & J. E 2144	Fahnestock Electric Co 2166	N	Telephone Maintenance Co 2162
Brady, John B	Fansteel Products Co., Inc 2141	Nagel Electric Co., The 2138	Tower Mfg. Corp., The 2025 Towner Radio Mfg. Co 2126
Branston, Inc., Chas. A 2118	Federal Radio Co 2170	National Airphone Corp. 2036-2037	Trimm Radio Mfg. Co 2186
Breakers, The 2171	Ferbend Electric Co 2191	National Carbon Co., Inc 2115	Tuska Co., The C. D 2166
Bremer-Tully Mfg. Co 2142	Formica Insulation Co., The 2123	National Radio Institute 2032-2033	
Bristol Co., The 2031	Freshman Co., Inc., Chas. 2130-2158-2182	New York Radio Co 2182	u
Brooklyn Radio Service Co. 2169	Frost, Inc., Herbert H 2116	Norden, Eauck, Inc 2136	
Brown & Co., Thos 2150 Brownlie, Roland2142-2158			U. S. Tool Co., Inc 2178
Buscher Co., C. A 2178		0	Uncle Al's Radio Shop 2187 Uncle Sam Electric Co 2120
Butts, Inc., C. W 2178	G	Ohio/ Electric & Controller	Union Fabric Co 2182
	Gilfillan Bros., Inc 2154	Co., The 2152	United Electric Stores 2154
C	Golden-Leutz, Inc 2124	Ohio Radio Sales 2170	United Radio Corp 2162
C. A. W. Labs 2116	Goodrich Rubber Co., The	Omnigraph Mfg. Co., The 2138	Unity Mfg. Co 2126
California Radio Minerals 2170	B. F 2151 Gould Storage Battery Co 2187	Operadio Corp., The 2149	Universal Cabinet Co 2186
Cannon & Miller Co., Inc 2152	Grebe & Co., Inc., A. H 2027	Owen, Richard B 2174 Ozarka, Inc 2042	
Carborundum Co., The 2165	orest to on, and, an anti-	Ozaraa, 1110	V
Cardwell Mfg. Corp., The, Allen D 2169		P	Valley Electric Co 2169
	**	P	Vesco Radio Shop 2154
Carter Radio Co 2128	H		1
Carter Radio Co 2128 Chemical Institute of N. Y.,	н	Pacent Electric Co., Inc 2166	
Chemical Institute of N. Y., Inc	Hammarlund Mfg. Co 2126	Palmer School of Chiropractic 2155	w
Chemical Institute of N. Y., Inc	Hammarlund Mfg. Co 2126 Hanscom, Allan T 2148	Palmer School of Chiropractic 2155 Parker, C. L 2166	
Chemical Institute of N. Y., Inc. 2189 Chicago Electric Devices Co. 2191 Chicago Fuse Co. 2120	Hammarlund Mfg. Co 2126 Hanscom, Allan T 2148 Harvard Radio Labs 2183	Palmer School of Chiropractic 2155 Parker, C. L	Wade Mfg. Co., Inc 2134
Chemical Institute of N. Y., Inc. 2189 Chicago Electric Devices Co. 2191 Chicago Fuse Co. 2120 Chicago Salvage Stock Store 2166	Hammarlund Mfg. Co. 2126 Hanscom, Allan T. 2148 Harvard Radio Labs. 2183 Hatfield & Son, H. D. 2116	Palmer School of Chiropractic 2155 Parker, C. L. 2166 Peiffer & Co. 2122 Pfanstiehl Radio Co. 2145	Wade Mfg. Co., Inc 2134 Walbert Mfg. Co2158-2162 Washington School of Car-
Chemical Institute of N. Y., 1nc. 2189 Chicago Electric Devices Co. 2191 Chicago Fuse Co. 2120 Chicago Salvage Stock Store 2166 Chisholm-Barfield Corp. 2166	Hammarlund Mfg. Co 2126 Hanscom, Allan T 2148 Harvard Radio Labs 2183	Palmer School of Chiropractic 2155 Parker, C. L	Wade Mfg. Co., Inc 2134 Walbert Mfg. Co2158-2162 Washington School of Cartoning
Chemical Institute of N. Y., Inc. 2189 Chicago Electric Devices Co. 2191 Chicago Fuse Co. 2120 Chicago Salvage Stock Store 2166	Hammarlund Mfg. Co. 2126 Hanscom, Allan T. 2148 Harvard Radio Labs. 2183 Hatfield & Son, H. D. 2116 Hayden Radio & Research Co., A. C. 2170 Heath Radio & Electric Mfg.	Palmer School of Chiropractic 2155 Parker, C. L. 2166 Peiffer & Co. 2122 Pfanstiehl Radio Co. 2145 Phenix Radio Corp. 2041-2139 Philadelphia Storage Battery 20. Co. 2113	Wade Mfg. Co., Inc. 2134 Walbert Mfg. Co. .2158-2162 Washington School of Cartooning .2142 Western Radio Mfg. Co. .2150
Chemical Institute of N. Y., Inc	Hammarlund Mfg. Co. 2126 Hanscom, Allan T. 2148 Harvard Radio Labs. 2183 Hatfield & Son, H. D. 2116 Hayden Radio & Research Co., A. C. 2170 Heath Radio & Electric Mfg. Corp. 2154	Palmer School of Chiropractic 2155 Parker, C. L. 2166 Peiffer & Co. 2122 Pfanstiehl Radio Co. 2041-2139 Phinix Radio Corp. 2041-2139 Philadelphia Storage Battery Co. 2113 Poeppel Novelty Works 2136	Wade Mfg. Co., Inc 2134 Walbert Mfg. Co2158-2162 Washington School of Cartooning
Chemical Institute of N. Y., 1nc. 2189 Chicago Electric Devices Co. 2191 Chicago Fuse Co. 2120 Chisago Salvage Stock Store 2166 Chisbolm-Barfield Corp. 2166 Cleveland Engineering Labs. 20., Co., The 2142 Colytt Laboratorica 2170 Consrad Co., Inc., The	Hammarlund Mfg. Co. 2126 Hanscom, Allan T. 2148 Harvard Radio Labs. 2183 Hatfield & Son, H. D. 2116 Hayden Radio & Research Co., A. C. 2170 Heath Radio & Electric Mfg. Corp. 2154 Hommel & Co., Ludwig 2146	Palmer School of Chiropractic 2155 Parker, C. L. 2166 Peiffer & Co. 2122 Pfanstiehl Radio Co. 2145 Phenix Radio Corp. 2041-2139 Philadelphia Storage Battery 2113 Poeppel Novelty Works 2136 Prairie State Radio Co. 2150	Wade Mfg. Co., Inc. 2134 Walbert Mfg. Co. .2158-2162 Washington School of Cartooning .2142 Western Radio Mfg. Co. .2150
Chemical Institute of N. Y., 1nc. 2189 Chicago Electric Devices Co. 2191 Chicago Fuse Co. 2120 Chisago Salvage Stock Store 2166 Chisholm-Barfield Corp. 2166 Cleveland Engineering Labs. 2142 Co., The 2142 Colytt Laboratorica 2170 Consrad Co., Inc., The 2040-2157-2172-2183-2186	Hammarlund Mfg. Co. 2126 Hanscom, Allan T. 2148 Harvard Radio Labs. 2183 Hatfield & Son, H. D. 2116 Hayden Radio & Research Co., A. C. 2170 Heath Radio & Electric Mfg. Corp. 2154	Palmer School of Chiropractic 2155 Parker, C. L. 2166 Peiffer & Co. 2122 Pfanstiehl Radio Co. 2041-2139 Philadelphia Storage Battery Co. 2113 Poeppel Novelty Works. 2136 Prairie State Radio Co. 2150 Precision Coil Co. 2116	Wade Mfg. Co., Inc
Chemical Institute of N. Y., 1nc. 2189 Chicago Electric Devices Co. 2191 Chicago Fuse Co. 2120 Chicago Salvage Stock Store 2166 Chisholm-Barfield Corp. 2166 Cleveland Engineering Labs. 2142 Co., The 2142 Colytt Laboratorica 2170 Consrad Co., Inc., The 2040-2157-2172-2183-2186 Continental Fibre Co., The. 2158	Hammarlund Mfg. Co. 2126 Hanscom, Allan T. 2148 Harvard Radio Labs. 2183 Hatfield & Son, H. D. 2116 Hayden Radio & Research Co., A. C. 2170 Heath Radio & Electric Mfg. Corp. 2154 Hommel & Co., Ludwig 2146 Hudson-Ross	Palmer School of Chiropractic 2155 Parker, C. L. 2166 Peiffer & Co. 2122 Pfanstiehl Radio Co. 2145 Phenix Radio Corp. 2041-2139 Philadelphia Storage Battery 2113 Poeppel Novelty Works 2136 Prairie State Radio Co. 2150	Wade Mfg. Co., Inc. 2134 Walbert Mfg. Co. 2158-2162 Washington School of Cartooning 2142 Western Radio Mfg. Co. 2150 Weston Electrical Instrument Corp. 2183 Windsor Furniture Co. 2121
Chemical Institute of N. Y., 1nc. 2189 Chicago Electric Devices Co. 2191 2191 Chicago Fuse Co. 2120 2120 Chicago Salvage Stock Store 2166 2166 Chisholm-Barfield Corp. 2166 2166 Cleveland Engineering Labs. 20. 2142 Co., The 2170 2170 Consrad Co., Inc., The 2040-2157-2172-2183-2186 Continental Fibre Co., The. 2158 Coyne Electrical School 2186	Hammarlund Mfg. Co. 2126 Hanscom, Allan T. 2148 Harvard Radio Labs. 2183 Hatfield & Son, H. D. 2116 Hayden Radio & Research Co., A. C. 2170 Heath Radio & Electric Mfg. Corp. 2154 Hommel & Co., Ludwig 2146 Hudson-Ross 2116-2118-2152-2154-2166-2170	Palmer School of Chiropractic 2155 Parker, C. L. 2166 Peiffer & Co. 2122 Pfanstiehl Radio Co. 2145 Phenix Radio Corp. 2041-2139 Philadelphia Storage Battery Co. 2113 Poeppel Novelty Works. 2136 Prairie State Radio Co. 2150 Precision Coil Co. 2116 Prest-O-Lite Co., Inc., The. 2147	Wade Mfg. Co., Inc. 2134 Walbert Mfg. Co. 2158-2162 Washington School of Cartooning 2142 Western Radio Mfg. Co. 2150 Weston Electrical Instrument Corp. 2183 Windsor Furniture Co. 2121
Chemical Institute of N. Y., 1nc. 2189 Chicago Electric Devices Co. 2191 Chicago Fuse Co. 2120 Chicago Salvage Stock Store 2166 Chisholm-Barfield Corp. 2166 Cleveland Engineering Labs. 2142 Co., The 2142 Colytt Laboratorica 2170 Consrad Co., Inc., The 2040-2157-2172-2183-2186 Continental Fibre Co., The. 2158	Hammarlund Mfg. Co. 2126 Hanscom, Allan T. 2148 Harvard Radio Labs. 2183 Hatfield & Son, H. D. 2116 Hayden Radio & Research Co., A. C. 2170 Heath Radio & Electric Mfg. Corp. 2154 Hommel & Co., Ludwig 2146 Hudson-Ross 2116-2118-2152-2154-2166-2170	Palmer School of Chiropractic 2155 Parker, C. L. 2166 Peiffer & Co. 2122 Pfanstiehl Radio Corp. 2041-2139 Philadelphia Storage Battery Co. 2113 Poeppel Novelty Works. 2136 Prairie State Radio Co. 2150 Precision Coil Co. 2116 Prest-O-Lite Co., Inc., The. 2147	Wade Mfg. Co., Inc. 2134 Walbert Mfg. Co. 2158-2162 Washington School of Cartooning 2142 Western Radio Mfg. Co. 2150 Weston Electrical Instrument Corp. 2183 Windsor Furniture Co. 2121 World Battery Co. 2120-2150 X. Y. Z.
Chemical Institute of N. Y., Inc. 2189 Chicago Electric Devices Co. 2191 Chicago Fuse Co. 2120 Chisago Salvage Stock Store 2166 Chisholm-Barfield Corp. 2166 Cleveland Engineering Labs. 2142 Co., The 2142 Colyt Laboratorics 2170 Consrad Co., Inc., The 2040-2157-2172-2183-2186 Continental Fibre Co., The. 2158 Coyne Electrical School 2186 Crescent Braid Co., Inc. 2150	Hammarlund Mfg. Co. 2126 Hanscom, Allan T. 2148 Harvard Radio Labs. 2183 Hatfield & Son, H. D. 2116 Hayden Radio & Research Co., A. C. 2170 Heath Radio & Electric Mfg. Corp. 2154 Hommel & Co., Ludwig 2146 Hudson-Ross 2116-2118-2152-2154-2166-2170 Hull & Co., S. W. 2167	Palmer School of Chiropractic 2155 Parker, C. L	Wade Mfg. Co., Inc
Chemical Institute of N. Y., Inc. 2189 Chicago Electric Devices Co. 2191 Chicago Fuse Co. 2120 Chicago Salvage Stock Store 2166 Chisholm-Barfield Corp. 2166 Cleveland Engineering Labs. 200. Co., The 2142 Colytt Laboratorica 2170 Consrad Co., Inc., The 2040-2157-2172-2183-2186 Continental Fibre Co., The. 2158 Coyne Electrical School 2186 Crescent Braid Co., Inc. 2150 Crescent Radio Supply Co. 2152 Crosley Radio Corp., The. 2135 Cruwer Mfg. Co. 2166	Hammarlund Mfg. Co	Palmer School of Chiropractic 2155 Parker, C. L	Wade Mfg. Co., Inc. 2134 Walbert Mfg. Co. .2158-2162 Washington School of Cartooning .2142 Western Radio Mfg. Co. .2150 Weston Electrical Instrument Corp. .2183 Windsor Furniture Co. .2121 World Battery Co. .2120-2150 X. Y. Z. X. L. Radio Co. .2178 X. L. Radio Labs. .2174
Chemical Institute of N. Y., 1nc. 2189 Chicago Electric Devices Co. 2191 Chicago Fuse Co. 2120 Chicago Salvage Stock Store 2166 Chisholm-Barfield Corp. 2166 Cleveland Engineering Labs. 2170 Co., The 2142 Colytt Laboratorica 2170 Consrad Co., Inc., The 2040-2157-2172-2183-2186 Continental Fibre Co., The. 2158 Corseent Braid Co., Inc. 2150 Crescent Radio Supply Co. 2152 Crosley Radio Corp., The. 2135 Cruver Mfg. Co. 2166 Cunningham, Inc., E. T. T.	Hammarlund Mfg. Co	Palmer School of Chiropractic 2155 Parker, C. L	Wade Mfg. Co., Inc. 2134 Walbert Mfg. Co. 2158-2162 Washington School of Cartooning 2142 Western Radio Mfg. Co. 2150 Weston Electrical Instrument Corp. 2183 Windsor Furniture Co. 2121 World Battery Co. 2120-2150 X. Y. Z. X. L. Radio Co. 2178 X. L. Radio Labs. 2174 Y. M. C. A. Radio Institute 2167
Chemical Institute of N. Y., Inc. 2189 Chicago Electric Devices Co. 2191 Chicago Fuse Co. 2120 Chicago Salvage Stock Store 2166 Chisholm-Barfield Corp. 2166 Cleveland Engineering Labs. 200. Co., The 2142 Colytt Laboratorica 2170 Consrad Co., Inc., The 2040-2157-2172-2183-2186 Continental Fibre Co., The. 2158 Coyne Electrical School 2186 Crescent Braid Co., Inc. 2150 Crescent Radio Supply Co. 2152 Crosley Radio Corp., The. 2135 Cruwer Mfg. Co. 2166	Hammarlund Mfg. Co	Palmer School of Chiropractic 2155 Parker, C. L	Wade Mfg. Co., Inc. 2134 Walbert Mfg. Co.

2174

2167 2186

2156 2137

Big Radio Book Send for it

At Oncewhich will bring in all distant stations on the found speaker in clear loud tones. A value of three times the price. Shipped on a guarantee of satisfaction or money back. A wonder set constructed on the new principle that requires no neutralizers and is self-balanced. Special features are low-loss coils, engraved bakelite panel, distortionless translated that requires the principle of the target of the fact of V V T V L **COMPLETE PARTS FOR 8-TUBE** SUPER-HETERODYNE 2 23-Plate Duplex or Laboratory
Type Low Loss Condensers
3 Remier or Columbia Intermediate Frequency Transformer
1 Remier or Columbia Tuned Circuit Transformer
1 Special Oscillator Coupler
1 Midget Condenser
2 Thordsmon or Columbia A. F.
Transformers
8 Bakelite Sockets
2 Thordsmon or Columbia A. F.
Transformers
1 Bakelite Forminal Strip for Binding Posts
2 Bakelite 6-ohm Rheostats
2 Bakelite 6-ohm Rheostats
2 Bakelite Potentiometer, 400
1 Ohms
1 Carter Double Circuit Jack
1 Dubiller 1 mfd. Condenser All complete parts for sets on this page consist of standard advertised guaranteed parts and include drilled baselite panels and wiring diagrams for easy set construction.

Everything guaranteed on money-back basis. All transportation charges paid. Den't ferget! Only genuine guaranteed parts used. Lack of space does not permit us to itemize individual parts, but you are fully protected by our money-back guarantee. Our Service Division is behind you. FREE BIG MONEY SAVING CONTAINING A THE BEAUTY OF THE BEAUT Free Service Department
Our radio engineers will help you solve all your radio problems, and furnish up-to-date information on set construction, operation and improvement. This service is free to our customers.

Order Direct From This Page! Save About One-half!

Compare our prices with others. Only highest grade nationally known GUARTEED parts. OUR GUARANTEE PROTECTS YOU, Money cheerfully refunded if you are not satisfied be sure to write your order and state prices plainly. Send post office or express money order of bank draft for to al amount to insure prompt shipment. ALL PRICES ON THIS PAGE INCLUDE SHIPPING CHARCES RIGHT TO YOUR DOOR if you are east of the Recky Mountains, Refer to any bank of the control of the recky mountains, Refer to any bank of the control of the recky mountains are all drilled. Instructions are simple and complete. Everything comes y to assemble. Order direct! All shipping charges prepaid.

THIS 5-TUBE SET \$39.50 FULLY BUILT AND WIRED COM-PLETE IN DARK HEAVY MAHOGANY CABINET OF BEAUTIFUL DESIGN

The Biggest 5-Tube Value on the Market

This Set with All Accessories, Includ-



COMPLETE PARTS FOR ACME 1-Tube \$15.85 ACME 4-Tube \$39.85

with Genuine Acme parts as specified, drilled bakelite panel and full wiring diagram.

COMPLETE PARTS FOR 2-TUBE HARKNESS SET

including Licensed Hark-ness Colls, Drilled Panel and wiring diagram. Easy to build. Wonderful \$16.95

COCKADAY 8-Tube Superhet-Reflex

As specified by \$65.80 Mr. Cockaday



COMPLETE PARTS FOR 5-TUBE **NEUTRODYNE RECEIVING SET**

Genuine Hazeltine Licensed Fada, or other Genuine Licensed Parts

1 7x24x'4 Drilled Panel
2 Thordarson or Columbia
Audio Transformers
3 4-in. Bakelite Dials
2 Precision Jacks
1 Bakelite Rheostat, 30-ohm
1 Bakelite Rheostat, 6-ohm
1 Bakelite Binding Post Strip
1 Bakelite Binding Post Strip
1 Chicad Binding Post Strip
5 Bakelite Sockets

1 .001 Condenser
1 .006 Mica Condenser
35 feet Hook-up Wire
1 Kit consisting of 3 Hazeltine
Licensed Neutroformers and 3 45
2 Neutrodons
1 Baseboard
3 Bezels
Complete blue - prints and
working diagrams.

COMPLETE PARTS FOR S-TUBE SET WITH RESISTANCE COUPLED

As designed by L. M. Cockaday,
Including drilled panel and wiring diagram, complete, ready to give. \$39⁶⁵ Easy to Build Your Own Radio Set

COMPLETE PARTS FOR 3-TUBE **COCKADAY RECEIVING SET**

1 Cockaday Coil
2 23-Plate Hy-Grade Cond.
Bakelite Rheostat, 6-ohm
2 Bakelite Rheostat, 30-ohm
3 Bakelite Sockets
1 high ratio Columbia or
Thordarson Transformer
1 Single Circuit Jack
1 Single Circuit Jack
1 Carolin Transformer
2 Double Circuit Jacks
2 3-in, Bakelite Dials
1 Grid Leak and Mica Cond.

7 Switch Points. 2 Stops.
1 Bakelite Binding Post Strip
7 Binding Posts
1 7x21x's in. Drilled Bake1 Baseboard
1 Switch Lever
24-ft. top-up
Complete blue-prints and wiring diagrams.
1-Tube Set

RANDOLPH RADIO CORPORATION 159 North Union Ave. **Dept.** 445 Chicago, Illinois

RADIO NEWS READERS' BUREAU

Time and Postage Saver

IN every issue of RADIO NEWS you undoubtedly see numerous articles advertised about which you would like to have further information. To sit down and written individual letter to each of these respective concerns, regarding the article on which you desire information, would be quite a task.

As a special service to our readers, we will write the letters for you, thus saving your time and money.

Just write the names of the products about which you want information, and to avoid error the addresses of the manufacturers, on the coupon below and mail it to us. If the advertiser requires any money or stamps to be sent to pay the mailing charges on his catalogue or descriptive literature, please be sure to enclose the correct amount with the coupon.

We will transmit to the various advertisers your request for information on their products.

This service will appear regularly every month on this same page in RADIO NEWS.

If there is any Manufacturer not advertising in this month's issue of RADIO NEWS, from whom you would like to receive literature, write his name, address and the product in the special section of the coupon below.

TEAR ALONG THIS LINE

	listed below that I would like to receive of RADIO NEWS.	detailed information on their pr	oduct as
DO NOT USE TH	ADDRESS (Street — City — State)	List here specific article on which you wish literature.	If Catalogu of complete line is want ed, check in this column

	nformation from a manufacturer whose adve	ertisement does not appear in this	month's issue
NAME	(Street — City — State)		**************************************

The Finer Side of Radio

A Song That Reached Home

A great baritone sang with uncommon fervor to his enraptured listeners

The melody seemed to string a golden chain of words for some responsive heart

It reached ten times a million hearts

For as the music faded into silence the singer said GOOD NIGHT, MOTHER!

And then we knew that song had gone straight and true to someone somewhere in that vast

Someone whose teardimmed eye saw not the wonderful singer but a little boy whose tousled head lay on her breast

And in that spell of mother love which makes millions kin

All those listening hearts "tuned in" to one heart

A heart that must have felt the magic of ten million prayers unified in one "God bless her!"

Our Bristol Loud Speaker had given us all the rich tonal quality of the singer's voice, its natural sweetness, its pathos. It had been a wonderful evening.



The Cabinet Model, shown here, has a full-floating wooden horn with extra long expansion chamber. Its "voice" is a high grade

electro-magnetic tone reproducer, not a phone unit. The case is of beautifully finished mahogany, 17x10x10½. Price, \$30.00.

There are also four horn models, priced from \$12.50 to \$25.00. Send for Bulletin 3022-S. Ask your dealer to demonstrate them on the Bristol Comparophon.

BRISTOL AUDITOPHONE Loud Speaker

Bristol Company Caterbury, Conne

AVIATION

MANUFACTURING

GOVERNMENT

ENGINEERING

SHIPPING

RESEARCH

arn\$75 to \$200 a Learn at Home

The astounding growth of Radio has created thousands of wonderful opportunities for earning big money. Millions upon millions of dollars are being spent every year since broadcasting has become so popular. Radio is indeed sweeping the world like a forest fire!

A few years ago only a very small number of men were actively engaged in Radio. Today, with but few exceptions, these men are holding key positions in this marvelous new industry. In the same way, the young men and ambitious boys who get into Radio now will be the leaders a few years hence. The opportunities right now are a hundred times greater than they were ten years ago.

Recognized Radio Experts In Urgent Demand

Trained experts-not just half trained amateurs-are needed for the many big paying positions which have developed as a result of the tremendous expansion of Radio. Broadcasting stations are constantly needing operators, stores are sadly in need of trained experts as salesmen, installers, repair men, demonstrators. Factories need inspectors, assemblers, testers and executives.

These are just a few of the opportunities. Radio operators on board ship travel all over the world without one cent of expense, see historically important places, meet prominent people on board ship, mingling with the passengers and earning salaries equal to \$200 a month in any land job. How often you've dreamed of travel, of being able to talk from experience of gay Paris, the beauties of the Mediterranean sunset, the awe of Egypt's pyramids. As a radio operator you can see them first hand.

Hundreds of Big Paying Positions Open Right Now-in Radio!

Hardly a week goes by without our receiving calls for our graduates. This is how some of them read: "We need the services of a competent Radio engineer"; "We want men with executive ability in addition to Radio knowledge to become store managers"; "We require the services of several resident demonstrators."

PROOF!

Pay Increases Over \$100 a Month



I am averaging anywhere from \$75 to \$150 a month more than I was making before enrolling with you. I would not consider \$10,000 too much for the transcent of the constant of

(Signed) A. N. Long, Greensburg, Pa.

Doubles Salary

I can very easily make double the amount of money now amount of money now than before I enrolled with you. Your course has benefited me ap-proximately \$ 3,000 over and above what I would have earned I would have earned had I not taken it.

Grand Junction, Colo





Strong Praise for N. R. I.



The N. R. I. course is by far the best. I have made very good money and enjoy my-self in the Radio game. A thorough training from the N. R. I. will from the N. set any man well on the road to happiness the road to happiness and prosperity Radio world.

Lawrence Vanek, Iowa City, Iowa.

Earns \$50 to \$83 a Week

I enjoyed every I enjoyed every one of your les-sons and had no trouble whatever. I earn \$50 to \$83 a week besides a commission on sales. Your course not only enabled me to get bigger pay but broadened my education as well.



Michael De Marco, Boston, Mass.

BROADCASTING BUSINESS

FREE Instruments This 1.000-mile Regenerative receiving



set is included in our course without charge. Our book, "Rich Rewards in Radio," tells you all about the practical training given with

25

Week as a Radio Expert in Spare Time

MORE PROOF!

\$405 In One Month

I cleared up \$405 in one month recently. Not so bad—is it—for a fellow who just completed your course a short time ago. I sure have been coining the dough. I never will regret the money I paid for your course. Emmet Welch, Peculiar, Mo. Peculiar, Mo.



From \$15 to \$80 a Week



Before I enrolled with you I was making \$15 a week on a farm. Now, I earn from \$2,080 to \$4,420 a year and the work is a hundred times easier than before. Since graduating a little over a year ago, I have earned almost \$4,000 and I believe the course will be worth at least \$100,000 to me.

\$100,000 to me. (Signed) George A. Adams, Tamaqua, Pa.

Triples Salary

I am earning three I am earning three
times as much as before enrolling and I
have clean interesting
work that takes me to
all parts of the globe.
I tell you, boys, it's
Radio for me.
Arthur Herke,
Vancouver, B. C.



Earns College Education



I entered the maritime service of the Radio Corporation of America and served several months on board ship. I not only liad the advantages of visiting foreign countries at no cost to me but

I was also able to save enough money to pay for my tuition to college.

G. E. Rogers, Troy, N. Y.

The big radio firms are coming to us for their men—they call on us first because they know that our graduates are one hundred per cent. trained experts—they are Recognized Radio Experts.



Earn Big Money While Learning

No matter if you know nothing at all about Radio or electricity, you can easily and quickly become an expert. Age is no drawback. Our method of teaching makes it fascinating and

become an expert. Age is no drawback. Our method of teaching makes it fascinating and interesting to learn the mysteries of this new science. Instruments for practical training given FREE with this course are shown at the bottom of this page.

Scores of our students earn big money during their spare time after finishing the first few lessons. Mathew Waldron made \$150 in one month—Fred W. Sullivan, of Fall River, Masse, made \$84.60 in three weeks. Graduate D. H. Suite, Newport, Ark., says: "While taking the course I did assembling, repairing, installing and made approximately \$900. This made my course pay for itself many times even before graduating." Student F. A. Kazmarek, Santa Cruz, California, says: "I have done over \$1200 worth of business in the past two months just in spare time. I am going to go a little easy on the selling business now so I can finish my course right away." Many students more than pay for their course in this way—while they are

Satisfaction is Guaranteed

Our faith in our method of training and in our ability to fit you for a bigger pay is evidenced by our guarantee to refund every cent of your money if you are not satisfied when you finish the course. The National Radio Institute, established in 1914, the first school to successfully teach Radio by mail, and now the largest Radio training organization in the world, stands behind that guarantee.

Send for FREE BOOK

We will gladly send you Free, without any obligation on your part, our book, "Rich Rewards in Radio," which gives you more facts about the big pay opportunities in Radio, tells you how we prepare you at home in spare time, and about how we are asked to fill hundreds of fine positions every year. No matter what you are doing now—no matter what your plans for the future are—send for this Free Book of wonderful opportunities. Mail the coupon NOW.

NATIONAL RADIO INSTITUTE Dept. 13GB Washington, D. C.



for practical training at home



These parts with instructions are given for experience and practical training in making and operating regenerative receiving apparatus.



This is the world-famous Natrometer-one of the three instruments given for scientific and practical home training in mastering the



These parts with complete instructions are given tions are given for practice in building a re-ceiving set of the more simple kind.

National Radio Institute, Dept. 13GB. Washington, D. C.

Without any obligation on my part, send me your book, "Rich Rewards in Radio," which tells all about the big-money opportunities in Radio, how spare time study will qualify me as a recognized Radio Expert and also how your Employment Service will help me get a good position.

Name	 											. 4	 9	Age.	
Charak															

City S	tate
--------	------



for all Long Wave Circuits

to make your phonograph a perfect loud speaker

for finer receiving!

for more distance on ear-phones

for bliss!

for better tuning

Each of these Rico products means added pleasure and value to your Radio Set.

RICO Products on this PageWill Improve Your Radio 100%



TROPAFORMERS

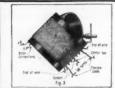
The sensitivity, selectivity and volume obtained in all types of long-wave circuits depends entirely upon the intermediate frequency transformer. TROPAFORMERS have been specifically designed to meet the new scientific requirements of long-wave circuits. The TROPAFORMER combines transformer and condenser. The condenser is shunted across the secondary winding of the transformer, and by its use the transformer may be tuned to any definite wave length between 3,000 and 9,500 meters. Only in TROPAFORMERS will long-wave circuit users find these advantages, and these advantages are \$6.75 patented for TROPAFORMERS exclusively!

Free Hook-up of the Famous Tropadope Circuit with Each Tropaformer Ordered

MELOTONE

PHONOGRAPH ATTACHMENT

Just adjust the simple MELOTONE PHONOGRAPH ATTACHMENT to your phonograph, and presto! you have converted your phonograph into a marvelous loud-speaker. That's all there is to it! The MELOTONE gives the clearest, purest shadings of speech and music. Dealers say it compares favorably with attachments selling at \$10 \$7.50 to \$15.



RICO TICKLER OSCILLATING COIL

In the RICO TICKLER OSCILLATING COIL, the rotor coil is used as the tickler. You will find low losses with this coil. It is a product of RICO scientific research, and has been proclaimed by experts as a masterpiece of construction.



RICOFONES

Probably the most popular headphones made, 500,000 RICO FONES are serving in every nook and corner of the world. There has never been so much quality put in a headphone at such a small price. For better tuning and distance, use RICOFONES, America's Favorite!



RICO FONEKUSHIONS

You'll know what real ear-phone comfort is when you use RICO FONEKUSHIONS. They are made of soft, pure sponge rubber, and fit any make of headphone. They are like soft, downy pillows for your distance-seeking ears. 50c



RICO STRAIGHT LINE CONDENSERS

In the old days, folks used horses. Now they can get as much power out of one auto as from 40 horses. It was all right, too, a few years ago, for folks to use the old-time condensers, but now, since Rico brought forth the RICO STRAIGHT LINE CONDENSER, which occupies two-thirds less space than the ordinary mesh plate type, everyone modernizes his set with the RICO STRAIGHT LINE CONDENSER.

 No. 411—.00025 mfd.
 \$1.75

 No. 423—.0005 mfd.
 1.75

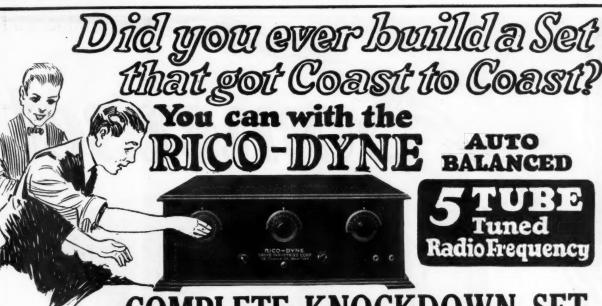
 No. 450—.001 mfd.
 1.75

 Inclusive with Dials.
 Without Dials, \$1.50

IF YOUR DEALER CANNOT SUPPLY YOU— USE THIS COUPON. NO MONEY DOWN!

RADIO INDUSTRIES CORPORATION
131 Duane Street, New York City

Please send me C. O. D. the following:Tropaformers, \$6.75Straight Line Condensers, \$1.75Ricofones, \$2.95Oscillating Coil, \$3Fonekushions, 50cMelotone Attachment, \$7.50.



COMPLETE KNOCKDOWN SET

Ready to tune in within a few hours!

EXPERTS PLACE "RICO-DYNE" IN THE \$100 SET CLASS

READ WHAT "RICO-DYNE" FANS WRITE US:-

"I was very careful to log every station that I tuned in on during the first week that I operated my Rico set which I built myself. I live in New York City and there are several other radio sets in my apartment house which are of the high-priced during the heavy broadcasting of New York stations much more clearly om my set than it does on theirs. Ne-braska is easy to get and late at night. I have tuned in on the Pacific coast."

(Signed) T. B. NEWMAN

(Signed) T. B. NEWMAN.

"I thought you would like to know something about the very keen selectivity of your Rico Kit which I built. In my neighborhood, it is very difficult to receive stations because we are located so close to a very powerful broadcasting station. I was very much surprised when I found that the Rico selectivity is so keen that I have no trouble at all in bringhing in the stations I want and tuning out the big brute so close at hand."

(Signed) J. E. HOWE.

"The Rico set which I built is a peach! It has plenty of "pep" and a peach! It has plenty of "pep" and my batterles when local stations are broadcasting, for they come in much too loud. As a matter of fact, when the local stations are broadcasting, if often disconnect the loud speaker and lay down the ear phones on the table and find that the programs come in so loud on the earphones alone that need the loud speaker. Distance I well a seed the loud speaker. Distance I well a seed the loud speaker. Distance I will be seed to be

Two Exclusive Principles Have Made RICO-DYNE the Fastest-Selling Radio Set in the Country

The combination of "RICO" CELLU-WELD Low Loss Coils and variable Condensers is made mechanically perfect.

The coils are the Lorenz type and are self starting. They are the low-loss type and starting. They are the low-loss type and are Cellu-Welded to a support on the Condenser end plate.

The condensers also are the low-loss metal end plate type, the stator and rotor being insulated from each other by means of hard rubber mounting strips.

Modern broadcasting requirements demand that a tuned radio frequency set be especially selective and non-oscillating. In the "RICO" "AUTO-BALANCED" Tuned "RICO" "AUTO-BALANCED" Tuned Radio Frequency Set this is accomplished by carefully setting the Coils at the factory at the neutralizing angle. This adjustment remains permanent due to the CELLUWELD process.

Due to this method of coil mounting used exclusively in RICO-DYNE Sets and Kits, there is no magnetic interference between coils and condensers. Complete

KNOCKDOWN SET

Together with a set of

RICOFONES

GREATEST RADIO VALUE IN HISTORY

This Is What You Get:

1—Pair Ricofones. 1—Genuine Bakelite Front Panel, completely drilled and engraved. 1—Genuine laminated Bakelite Sub-Panel—with sockets already mounted. All mounting holes properly drilled. 3—Auto Balanced Tuned Radio Frequency Units—perfectly matched and balanced. 3—Beautiful 4-inch Dials. 1—Variable Grid Leak and .00025 M.F. Condenser. 1—4 to 1 Audio Transformer. 1—2 to 1 Audio Transformer. 1—002 Fixed Mica Condenser. 1—006 Fixed Mica Condenser. 2—Single Circuit Jacks. 1—Filament Control Switch. 1—30-ohm Rheostat. 1—10-ohm Rheostat.

FOR THOSE WHO WANT TO BUY ONLY THE

RICO-DYNE

Here Is Just What They Want:

It seems unusual that with the tremendous volume, selectivity and distance-range of the Rico Auto Balanced set, it should be so simple to construct. Yet, nevertheless, this is true. We have letters from fans who tell us that they constructed their Rico set within a few hours. The plans which accompany the Rico Kit are so simple that we believe this is so. Any beginner need only to read English in order to construct the Rico set. This Kit contains 3 Auto Balanced Tuned Radio Frequency Condensers, inductance Units, factory matched, book of instructions and drilling template. You can't go wrong!



RICO-DYNE HAS SET **NEW RECORDS IN RADIO!**

NOT A CENT DOWN COUPON!

RADIO INDUSTRIES CORP., 131 Duane Street, New York City. Gentlemen: As my dealer cannot supply me, please send me C. O. D.:-COMPLETE KNOCKDOWN SET-\$38.75

KIT,-\$16.50 Name ...

City . State



SOMER SHELBOURNE MODEL 4-B

85

Fruth in Radio

Somerset Shelbourne Model 4B

Shelbourne

SOMERSET SHELBOURNE Model 4B 4 Tubes
—Single Dial Control. Our perfected tuned radio
frequency circuit with single dial synchronized
control.

control.

Simple to operate and highly selective, with clear
tones and volume that are found only in the higher
priced receivers.

Storage battery or dry cell operation, automatic filament control, the finest "low loss" condensers, and the famous SOMERSET Calibrated Transformers. Compartments for large sized storage "A" and dry cell "B" batteries. Mahogany finish cabinet, hand-rubbed two-tone effect. List \$85

Putting the Square Deal in Radio

THERE are other radio receivers as good as Somerset but they cost more.

There are other radio receivers at the same price as the Somerset—but the quality is lower.

We do not claim to make the best receivers nor the cheapest receivers—for both of these are doubtful distinctions.

But we do believe we are the first to introduce a complete line of distinctively high quality, cabinet-enclosed radio receivers at prices which the average purchaser can afford.

We do believe we are pioneers in the field of honest prices for good design, good material and good workmanship—in the field of full value radio receivers.

TRUTH IN RADIO

This is the Somerset policy; to give the radio buying public, so long confused and disappointed by extravagant and misleading claims, the assurance of honest value for every dollar spent.



The Perfectly Tuned Radio Frequency Line

SOMERSET Radio Receivers sell easily and quickly because they are what the public wants the utmost in value for their money, simplicity of operation, efficiency in results, and real beauty in appearance.

On all these counts-and more-Somerset Radio Receivers on an these counts—and more—somerset Radio Receivers challenge comparison, feature for feature, with any others at or near their price—bar none.

It needs no argument nor persuasion - every Somerset Radio Receiver speaks for itself—a piece of fing furniture enclosing an instrument of super-craftsmanship.

Backed by the Somerset Guarantee

W E will cheerfully and promptly make good any Somerset Radio Receiver which does not fully measure up to the purchaser's expectations of quality and value. If for any reason it is found to be not exactly as represented, it should be returned for exchange or refund of the purchase price, as preferred. This guarantee means exactly what it says, without reservations.

Easy Selling Features

EVERY woman recognizes at sight the superior lines and finish of Somerset cabinets. They're distinctive in their rich two-toned, hand rubbed mahogany finish—an artistic addition to any drawing room.

The receiver is worthy of this fine setting, finest of materials and parts, superior workmanship and finish, painstaking care in the little details which mean so much in results.

For example, the single dial control on the Shelbourne and Standish models—by the use of gears, the con-densers are connected and perfectly synchronized, permitting operation by a single tuning knob. Of course, this is made possible only by the most careful selection and matching of condensers, and coils, but the finished product is a revelation in easy tuning.

And Real Dealer Service

SOMERSET Dealer Service offers full cooperation and tangible, cash-drawer aid in selling Somerset Radio Receivers. Furthermore Samerset Dealer Service also includes complete service on tubes, phones, batteries, loud-speakers and aerials at regular dealer discounts.

Mail To-day for Profit Pay

YOU wouldn't pass by money that would be yours for the picking up—don't pass up this chance to carn of profit opportunity—Fill out and mail Coupon NOW.

NATIONAL AIRPHONE CORPORATION 16-22 Hudson Street, New York City

Without any obligation to me, send full details and information on the Somerset line and remarkable Dealer Service.

Address....

NATIONAL AIRPHONE CORP

Manufacturers of Somerset Radio Receivers 18 HUDSON STREET, N. Y. CITY

COLUMN AIRPHONE COSP.

SOMERSET STRATFORD MODEL 4-A

SOMERSET MARS Model 5A 5 Tubes
Three Dial Control, Two stages tuned radio
frequency, detector, and two stages audio frequency,
Storage battery or dry cell operation, automatic filament control, highest quality "low loss" condensers
and the famous SOMERSET Calibrated Transformers, Artistic cabinet
tubbed mahogany finish providing space for storage "A"
and dry cell "B" batteries. Size 29° x14° x11".

List S

SOMERSET MARS MODEL 5:A

List \$75



Truth in Radio

Build Your Own Receiver-It's Easy The "No-Sod-er" W

Revolutionary Improvement in Assembling Radio

No solder-No bare wires-No poor connections-No dissatisfaction. No tools needed except a common screw-driver and common pliers.

The state of the s All connections are made by the use of our flexible, insulated eyeletted connecting wire in place of bus bar or wire, and solder. And in a fraction of the time usually required when using the old fashioned way. And when the job is done it is neat and your connections are tight.

4-Tube Roberts Knock-Out \$4856 Postpaid Circuit Approved by Canadian Government Range 3500 Miles Range 3500 Miles



Tuned Radio Frequency 42 93 Postpaid Kit X K 9216 Range 3500 Miles Range 3500 Miles

If you wish the finest 5-tube set to be had, here it is. We have produced a receiver as nearly perfect as possible with present day radio engineering principles. To do this we have adopted low loss principles throughout thus reducing all losses to the minimum. Special Features: Simple to construct and operate; highly efficient; low loss design throughout; self-neutralized; extremely sensitive over long and shorter discovery established the view of the production of the provided on approval, no money in advance.

MUCH FOR LITTLE

Range 3500 Miles

Celebrate Van B. Roberts and Radio Broadcast Magazine. Arthur II. Lynch, Editor, says: 'II is the best we have over all the state of the state it comes out a winner. It is not merely the best 4-tube receiver, but the best by a very good margin." The Canadian Government has endorsed and recommends it. Read below the kind of parts you get. Price includes large cabinet. Order It. You won't be making a mistake, It. You won't be making a mistake, advance.

Advantages of Our "No-Sod-er Method"

No solder.
Clean—not "messy,"
No expense for soldering iron or supplies.
Dependable.
Positively firm connections—none faulty as
using solder which often easily jars loose.
Less resistance or loss than in using solder.

Less resistance or loss than in using solder. Absolutely safe.

Positively never any danger of short-circuiting as our "No-Sod-er" connectors are insulated with woven thread over rubber.

Terminals are uniformly neat.

No loss of time in making connections—unnecessary to use care in placing, since they may touch each other without short-circuiting.

ing. Easily handled—unbreakable. No special care needed in handling as all are insulated. A Kit can be wired in a fraction of the time required for wiring with bus bar and

time required for wiring with the back and solder.

Convenient.

On our improved blueprints the binding posts are numbered in pairs so you may quickly and easily attach the connector prop-

erly. Quickly fastened. No skill or knowledge

The Simplest and easiest method ever devised!



3-Tube LoLos \$3025 Postpaid—Kit X K 6996 Range 1000 Miles on Loud Speaker Speaker



Speaker

Nothing new-fangled or freaky about this won-derful new low loss receiver. Its great secret lies in the fact that nearly all losses are done away with, using energy usually wasted in other sets—hence the aston-ishing results in distinct, and the sets of the set of t clearness of reception simplicity of construc-

Fifteen stations were received on loud speaker
burgh, Cleveland, Elgin and Chicago, Ill., 8t. Cloud, Minn., and Davenport, Iowa. Cuts
right through local stations. Sure to please. Order it on approval, no money in advance.

1-Tube Single- \$ 1 1 79 Circuit





SEE OFFERS ACCESSORIES

We Give You the Best Parts Made

Look at this list of well-known, high-trade, standard, dependable, satisfaction-giving parts which we use in our line of superior Kits as detailed in our catalog which will be sent to you will be sent to yo

BE SURE TO SEE

ORDER

Postpaid Kit X K 9182 Range 1500 Miles

WE SHIP IN 24 HOURS SATISFACTION GUARANTEED RADIO SPECIALTY CO.. Kit Div. 6795. No. 25-A West Broadway. N.Y.

You Need This Catalog of "Build Your Own" Radio Receiver Quick

KITS

Shows you how you can easily assemble your own set without the troublesome bus bar and solder and in a fraction of the time required the old fashioned way.



Solution ApprovalNo Money in Advance

Catalog Contains Detailed Offers

of the following Kits and many Parts and Accessories. All Kit Prices include large Cabinet.

RASCO KITS

UNASSI	EMBLED RECEIVERS	Our P	rice Pos	stpaid*
				· Com-
Kit No.	Rasco 5-Tube COCKA	Parts	sories	plete
XK9190	Rasco 5-Tube COCKA-			
	DAY	851.66	\$38.07	\$89.73
XK9188	Rasco 5-Tube FAMOUS	*	4	
202000	T. R. F		38.07	78.96
XK9212	Rasco 1-Tube KNOCK			
	OUT REFLEX	21.52	12.84	34.36
XK9214	Rasco 3-Tube KNOCK-			
	OUT REFLEX	28.86	27.75	56.61
XK9213	Rasco 2-Tube ROBERTS			
	KNOCK-OUT	31.35	20.66	52.02
XK9215	Rasco 4-Tube ROBERTS	4		
	KNOCK-OUT	48.56	35.29	83.85
XK6996	Rasco 3-Tube LOLOS			
	EXPLORER		27.73	57.98
XK9189	Rasco 8-Tube PACIFIC			
	CIRCUIT	57.13	61.11	118.24
XK9217	Rasco 7-Tube PRESS-			
	LEY SUPER	83.75	55.08	138.83
XK9184	Rasco 1-Tube REFLEX		17.16	36.25
XK9185	Rasco 2-Tube REFLEX		20.66	
XK9186	Rasco 3-Tube REFLEX		27.73	
XK9187	Rasco 4-Tube REFLEX		33,36	62.59
XK9182	Rasco 1-Tube SINGLE-			
	CIRCUIT		10.77	22.56
XK9183	Rasco 3-Tube SINGLE-			
	CIRCUIT		25.55	47.20
XK9219	Rasco 1-Tube THREE-			
	CIRCUIT		13.93	31.62
XK9218	Rasco 3-Tube THREE-			
	CIRCUIT	30.49	25.55	56.04
XK9216	Rasco 5-Tube SICKLES			
	T. R. F	42.93	38.07	81.00
XK4477	Rasco 6-Tube TROPA-			
	DYNE	60.50	52.88	114.38
XK9211	Rasco 5-Tube WORK-			-
	RITE NEUTRODYNE	38.95	53.37	92.32

Other Popular Kits

	MBLED RECEIVERS			stpaid* - Com-
Kit No.	Name	Parts	sories	plete
XK9162	ACME Model A, 4-tube.	\$56.87	\$50.12	\$106.99
XK9161	ACME Model S, 5-tube.	70.00	55.68	125.68
XK9205	ERLA, 1-tube		17.60	34.91
XK9206	ERLA, 2-tube	25.81	25.11	50.92
XK9207	ERLA, 3-tube	34.56	32.98	
XK9208	ERLA, 4-tube		38.23	77.16
XK9209	ERLA, 5-tube	43.31	51.75	95.06
XK9210	ERLA, 5-tube (for loop	1		
	aerial)	43.31	52,62	95.93
XK9170	FRESHMAN MASTER-			
	PIECE, 5-tube	34.56	41.73	76.29
XK9181	HANSCOM SUPER, 6-			
	tube	39.37	82.28	121.65
XK9166	HARKNESS COUNTER			
	FLEX, 3-tube	31.97	31.41	63.33
XK9165	HARKNESS REFLEX.			
	2-tube	29.10	26.30	55,40
XK9155	MELCO SUPREME.			
	KD-24, 4-tube	78.75	34.56	113.31
XK9156	MELCO SUPREME			
	KD-25, 5-tube	87.50	38.06	125.56
XK9195	RASLA BEFLEX, 1-tube	20.12	18.04	38.16
XK9196	BASLA REFLEX, 2-tube	30.62	29.48	60.10
XK9197	BASLA REFLEX, 3-tube	36.75	32.98	69.73
XK9168	WORK-RITE DE LUXE			
	NEUTRODYNE, 5-tube	58.18	42.61	100.79
*We pay	transportation on every	thing	but ba	teries



Your Own Receiver and Accessories without Charge

Full Particulars in this Catalog-No. 14-FREE

Send for FREE Catalog-TODAY!

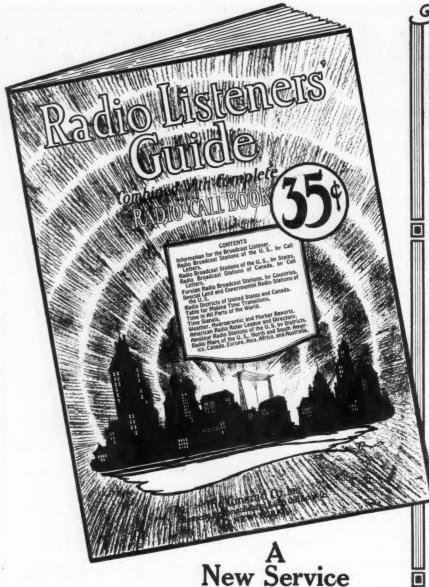
RADIO SPECIALTY COMPANY

Kit Div. 6795 -:-

25-A West Broadway, New York

TEAR OFF AND MAIL THIS COUPON NOW

RADIO Please	(If	you	ı d	les	ire	9 (ou	r	F	Ci	t	C	at	al	log	g,	P	le	a	se	1	VI	it	e	61	X	99	1	n	8	qı	18	r	e)	-		1	
You m	ay s	hij	o ti	he	fo	11	ov	vi	ng	5	ge	00	ds	6											-										- 1-	Ii		yo
		٠.																											*				*					
																														٠.								
																														٠.								
Name .															. ,																							
Address																																						



Consrad has developed a special service for every user of the New Consrad "Radio Listeners' Guide and Call Book" that is designed to enable you to keep your station call record up to the minute, in line with all changes in stations and any new

stations that are assigned call letters from month to month.

And the Radiosing

It consists of monthly, detailed supplement sheets carrying all information in regard to the call letters of new stations and changes of old ones. By means of this service, you can keep a practical, complete record of broadcast stations at all times.

There is a special coupon in every copy of the "Radio Listeners' Guide and Call Book" offering the purchaser the opportunity of subscribing to this six months service for the low price of 50c.

233 Fulton Street New York, N.Y.

Radio's finest and most complete Call Book

There has never been any radio book for the amateur, the engineer or the regular radio broadcast listener exact-ly like this great Constant edition.

Here is a book for everybody, covering all the information any listener needs to most thoroughly enjoy a radio program. It tells how to use and operate a radio set to the best advantage. It tells where, by whom, and on what wave length every radio broadcast station of the United States is operated, etc.

Altogether there are 114 pages filled to the brim with practical data. There is not a page of advertising—all text material for the user.

This is the one radio book that should be at the side of every radio receiving set in operation.

Table of Contents

Information for the Breadcast Listener. Radio Broadcast Stations of the U. S., by Call Letters.

Radio Broadcast Stations of the U. S., by States.

Radie Broadcast Stations of Canada, by Call Letters.

Foreign Radio Broadcast Stations, by Countries.

Special Land and Experimental Radio Stations of the U. S.

Table for Making Time transitions.

Time in All Parts of the World.

Time Signals.
Weather, Hydrographic, and Market Reports.

American Radio Relay League and Directory.

Amateur Radio Stations of the U. S., by Districts.

Radio Maps of the U. S., North and South America, Canada, Europe, Asia, Africa, and Australia.

114 Large Pages of Real, Prac-tical Information-No Advertising

Size 9 by 12 inches.

Bound with Beautiful Stiff Two-Color Cover.

Published Twice a Year

The Consrad Co., Inc.

Lacault Scores Again,



The new Ultra-Lowloss condenser is the latest improved radio device de-signed by R. E. Lacault, formerly Associate Editor of Radio News, the originator of Ultradyne Receivers and now Chief Engineer of Phenix Radio Corporation.



ULTRA-LOWLOSS CONDENSER



ULTRA-VERDIER CONTROL

Simplifies radio tuning. Pencil-record a station on the dial—thereafter, simply turn the finder-to your pencil mark to get that station instantly. Easy—quick to mount. Eliminates fumbling, guessing. Furnished clockwise or anti-clockwise in gold or silver finish. Gear ratio 20 to 1.

Silver \$2.50 Gold \$3.50



This seal on a radio product is your assurance of satisfaction and guarantee of Lacault design.

IKE every Lacault development, this new Ultra-Lowloss Condenser represents the pinnacle of ultra efficiency-overcomes losses usually experienced in other condensers.

Special design and cut of stator plates produces a straight line frequency curve, separates the stations of various wave lengths evenly over the dial range, making close tuning positive and easy.

With one station of known frequency located on the dial, other stations separated by the same number of kilocycles are the same number of degrees apart on the dial.

In the Lacault Ultra-Lowloss Condenser losses are reduced to a minimum by use of only one small strip of insulation, by the small amount of high resistance metal in the field and frame, and by a special monoblock mounting of fixed and movable plates.

> At your dealer's, otherwise send purchase price and you will be supplied postpaid.

Design of low loss coils furnished free with each condenser for amateur and broadcast frequencies showing which will function most efficiently with the condenser.

To Manufacturers Who Wish to Improve Their Sets

The Ultra-Lowloss Condenser offers manufacturers the opportunity to greatly improve the present operation of their receiving

Mr. Lacault will gladly consult with any manufacturer regarding the application of this condenser to any circuit for obtaining maximum efficiency.

PHENIX RADIO CORPORATION, 114 EAST 25th ST., NEW YORK

New OZARKA Junior Model Fully Equipped—\$100

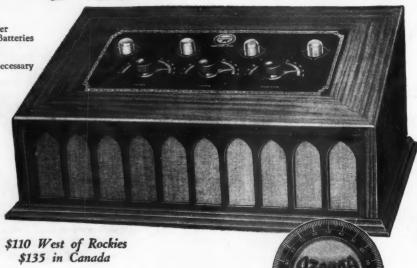
COMPLETE WITH

Four No. 199 Tubes Four No. 199 Tubes
Built-in Hy-Power Loud Speaker
Four Eveready 22 1/2-volt "B" Batteries
Three Eveready Dry Cells
One Eveready "C" Battery
Aerial Equipment, everything necessary NOTHING MORE TO BUY.

THERE IS A REASON

This instrument is sold direct from the factory to you thru our own factory representative; therefore, our selling expense is less. No middlemen's profit to pay.

Compare Ozarka quality with every other instrument on the market—compare prices and you'll quickly realize how you can secure the highest radio quality possible at prices which are as low as the lowest. More than this, all Ozarka instruments are backed by the Ozarka service.



Let our factory representative bring the No. 299 to your home

FIND OUT in your own home, by tuning this instrument yourself, just factory representative asks is an opportunity to let you prove to your own satisfaction that the Ozarka Junior No. 299 is the greatest radio value for \$100.00.

HE Ozarka Junior No. 299 meets an insistent demand for a radio instrument, operating on dry cells which will deliver plenty of volume from long distances - with loud speaker and batteries all enclosed-an instrument of quality which is a hand-some article of furniture and yet all complete for \$100.00.

Cabinet is 23 inches long, 15 inches deep, 6½ inches high at the front and 10 inches high at the back; waxed walnut finish, same as used on high priced furniture. Panel is of etched bronze with dull gold markings. Most convenient shape and size possible to make tuning case. ing easy.

Entire front has open grill in attractive design, lined with gold cloth — built-in large goose neck loud speaker of wood veener equipped with powerful loud speaker unit, not a head phone unit, but a power unit weighing 3½ pounds, giving a volume and tone unexcelled in any loud speaker.

Door in back enables dry cells, "B" and "C" batteries to be put in place inside—not a wire in sight — even aerial and ground come in thru the back. Tuned radio frequency circuit especially designed to produce full efficiency from dry cell tubes No. 199. Operates on any outside aerial or on an inside aerial run around the room behind the picture moulding.

The Ozarka representative will gladly bring the instrument to your home—he won't tell you what it will do-he won't tune it himself, but he will let YOU do all the tuning. If, by your own operating, you are not thoroughly convinced that the Ozarka Junior No. 299 is just what you want, then you are under no obligations whatsoever.

If the instrument itself will not prove its value to you, then no salesman can do it — Ozarkas will sell themselves if given the opportunity.

Ozarka factory representatives are trained directly under Ozarka engineers so that they know every detail of Ozarka instruments and can correct any trouble which may ever come up. If you put an Ozarka in your home, it will work perfectly; more than this, a trained Ozarka representative will keep it working perfectly.

Ozarka instruments and Ozarka service mean perfect radio satisfaction to you.

Why not ask us for the name of the nearest Ozarka representative—give us the name of your county, we'll gladly do it.

Attractive Openings for a Few More Representatives

HE Ozarka Junior No. 299 is a typical Ozarka value—made possible by the Ozarka plan of selling thru direct factory representatives. This is only one example—the Ozarka line offers other types of four tube instruments as low as \$39.50 (without accessories); an exceptional op-portunity for men of the right caliber to establish themselves firmly in a profitable radio business of their own.

The Ozarka organization today consists of \$100 men who are making from \$50 to \$300 per week. More men are needed in open territory; men who are willing to learn what we are willing to teach them; men who recognize that they must learn how to correct troubles if they expect to make a success of selling radio instruments.

of selling radio instruments.

This work can be started in yourspare time—evenings are the best time to sell radio. As you learn you will grow, and it will only be aquestion of time until it will pay you to give Ozarka all your time and own a business of your own—be independent Exclusive territory is given to men who have proven that they can handle it successfully. Your profit is immediate, because Ozarka instruments will sell themselves if a demonstration is arranged for. The amount of capital required is small, but some is absolutely necessary. No knowledge of radio is necessary—allwe ask is willingness and patience to learn, and that you are somewhat mechanically inclined.

There are many men who work hard but don't



OZARKA, Inc., Chicago, Ill.

804 Washington Boulevard

EDITORIAL AND GENERAL OFFICES, 53 PARK PLACE, NEW YORK

Vol. 6

MAY, 1925

No. 11

Mental Radio" By HUGO GERNSBACK

INCE broadcasting has become worldwide, a peculiar effect has made itself felt upon a number of individuals, the effect increasing at a rate that is viewed with concern in many quarters. Government officials, doctors, editors, and many other professional people are continually annoyed by persons with this new delusion. The writer, for instance, receives an average The writer, for instance, receives an average of from ten to fifteen letters every week from various people who are possessed of this affliction, and he sees, in the course of a month, a number of individuals who call upon him in person.

The correspondence or the talk usually centers around the following, and the symptoms in most cases seem to be uniformly the same. The receiver of the "mental radio" messages in all cases states that he or she has received "radio" messages steadily, every day, for a stretch of several years. Sometimes, the radio message is of a spiritual, uplifting nature, but more often, and most numerously, the messages are of the r ecuting sort, where the message purports to come from an e. rying to do the recipient harm.

Close questioning of the interviewed subjects nearly always brings forth the information that the "messages" are strongest at night before the subject goes to sleep, or that he is awakened by them. The voices in all cases appear to be real and loud and are supposed to startle the subject to such a pronounced degree that he or she thinks a sort of invisible loud speaker is located in the room. The radio messages are always supposed to be broadcast by modern radio transmitting apparatus, usually operated by the enemies of the subject.

F course, every scientifically inclined person who receives cor-respondence of this sort promptly relegates it to the waste ket. The condition of the subject is, to be sure, very well understood by psycho-analysts, psychiatrists and alienists. understood by psycho-analysts, psychiatrists and alienists. No good, however, will ever come of just calling these subjects insane, or unbalanced. The writer, who has talked to a number of them, has found that in many cases they are very rational in points other than the one delusion. Nearly always these people know nothing at all of science or radio, and view the new radio art with great awe. They often have the idea that radio is only another form of mental telepathy. The writer is quite certain that if these deluded people understood the fundamentals of the radio science they could easily be cured, provided the mentality of the subject is such that he or she could grasp the facts.

It is usually a good plan to refer such a person to a good radio.

It is usually a good plan to refer such a person to a good radio It is usually a good plan to refer such a person to a good race primer, or elementary radio text, written in such language that even the layman can understand it. There are a number of such books procurable at present. If the subject can be made to read them he will usually come to see that, as far as mental radio is concerned, it is non-existent and is simply an hallucination.

The writer desires to cite the following case which came under his observation some months ago.

The subject was a middle-aged woman, rather irrational in general, and from her appearance seemed to be highly nervous. Subject was unmarried. She complained of radio messages coming to her at all times of the day and night, particularly at such times when she was riding in street cars, subways or railways. Subject was also kept awake by these continuous messages, all purporting to come from some relatives who wished her bodily harm. The supposed messages kept increasing continuously as she grew older. Subject said that when putting cotton into her ears the messages would

stop, sometimes, but not always.

The case was listened to attentively and patiently, and at no time was disbelief shown. The writer then gave the subject an ordinary magnet taken from an old telephone receiver which he happened to have in his desk. He asked her to keep this magnet under her pillow while she was sleeping, and to report within two weeks. The subject promptly returned within two weeks and reported great improvement. Still further improvement was reported within another two weeks, the writer having suggested that the subject sleep with ears tightly closed. Although she was to report at a later date, she never returned, evidently having been cured.

Here was an auto-suggestion case, pure and simple, for scientific readers will readily understand that the magnet had nothing whatever to do with the case. It was simply that the subject believed in the cure and was affected by it. A piece of wood would have been just as effective as the magnet.

Naturally, not all cases can be treated alike, and where the subject is irrational to a high degree, it would not do to practice such a method. The best way is to try to explain to afflicted persons, in simple language, why radio cannot possibly have any effect whatso-ever on the human brain. If any cases come to your observation, the subject might be told the following:

R ADIO, at the present time, can be broadcast only by one means, and that is electromagnetic, commonly called radio waves. In order to send out such waves, it is necessary to have a sending or transmitting station. No one is allowed to have such a station unless he is licensed to do so by the Government. The Government has the names and addresses of all such stations. Not only has the Government such information, but the Radio Inspectors of each nine Districts watch carefully over all stations, to see that they are not misused. By means of radio receiving instruments, the Department of Commerce readily keeps tab on all stations, and it is practically impossible for anyone to send any messages whatever on an unlawful wave-length without being almost immediately caught. In other words, amateurs and private individuals are restricted to a certain wave-length which they cannot overstep without immediate penalty. Broadcast stations have another wave-length, while ship and shore stations have still another. All of these stations are under constant surveillance, not only by the Government, but by all who have re-So it will be seen immediately that if someone were sending out threats or meaningless messages, he would be almost instantly detected, because of the hundreds of thousands of receiving sets scattered around every nook and corner of the country and, for that matter, all over the world. It will thus be seen that, so far as radio transmission is concerned, the subject afflicted with mental radio must be convinced that there can be nothing to it.

Now let us see why it is impossible for the human mind to receive without instruments and apparatus any outside radio message. If you are located even as close as a mile from the most powerful receiving station, the energy which is received on a collecting antenna is so infinitesimal that it amounts to less than 1/100,000 of a fly-power. In order to detect such a message, it is necessary to use, even in the simplest radio apparatus, certain instruments that must magnify this weak message enormously. The crystal detector and a pair of telephone receivers of the simplest radio set may be compared to a fairly good microscope, and even then the received energy is so small that one must have the telephone receivers pressed close to the ears in order to hear the radio message at all.

On the other hand, the human brain is so constituted that it is impossible for it to receive radio messages without the intermediary of some apparatus such as a detector and telephone receivers. For instance, if one is totally deaf, and a locomotive sounds its whistle within a block, he cannot hear the sound. If you are totally blind, you cannot see and cannot receive luminous impulses. You cannot feel a coin without touching it with some part of your body.

Now, then, sound waves are of a low order of vibration, vibrating at the rate of from eight to 20,000 oscillations per second, after which we can hear them no longer. Broadcast radio waves vibrate at the rate of from about 30,000 to 300,000,000 cycles per second, while light waves vibrate at the average rate of approximately 600,000,000,000,000. It will be seen from this that radio waves have a vibration much too high to be heard by the human ear, while they are not fast enough to be seen by the eye. Lengthy laboratory experiments have shown that human beings, and animals for that matter, are so constituted that they have no organs by which they can receive radio or electromagnetic waves unaided. Radio waves must be rectified and no organ in the body, not even the brain, can do this.

"Black Listening is Theft"

By H. GIESECKE

LICENSED STATION?

TIS THE GITTEST LITTLE

ANTENNA

© 1919, by E. P. Co.

You are wrong. This is not in darkest Prussia, where everything is verboten (forbidden). It merely represents an American amateur station A. D. 1919, when the Alexander amendment becomes a law. (The accompanying caption appeared under the original cartoon in the February, 1919, issue of the ELECTRICAL EXPERIMENTER.)

HEN in the fall of 1923 newspapers announced that the first German broadcast station had begun its transmission in Berlin, and that everyone, by a payment of the prescribed license, could become a participant in the broadcasting, not every reader knew to what the new order of things referred. But far less did they understand the technique of the installation, nor the legal and police regulations which underlaid the new public service.

The situation soon changed. Like mush-rooms shooting up out of the soil, new technical journals and handbooks appeared, awakening, especially in the young, the most lively interest in the technique of receiving sets, showing with what astonishingly simple apparatus broadcasting could be caught out of the ether. That, in addition to this, a license was required, very few knew; if they did know it, they went on their way without thinking about it. What business was it of the Government if one strung some wires in his residence and wound coils? Neighbors did it, his companions in school and many acquaintances also. Was he to pay money for that, and in considerable amounts? What harm did it do anybody if a few more people listened when the transmitter was broadcasting? And if one finally did get caught, what dreadful thing could happen?

So in a few months a great number of illegal hearers (schwarzhörer) were devel-

oped, an army whose exact strength is unknown today, but which in number is several times as great as the 'list of paying participators. Through this action, which spread like a plague through all ranks of the populace and led innumerable people to evading the license fee, the progress of broadcasting was greatly endangered, as is perfectly evident; indeed, experts were able almost to predict the day when the broadcast stations, for lack of means, would have to cease their operations unless some fundamental change was made.

THE NEW LAW

How such a fundamental change can be carried out and must be carried out, present developments show. In order to make everyone a participant, including those with small pecuniary resources, the license fee must be lowered and the registration made easier. To the investigators and technically educated groups who wish to work productively in radio, the possibility must be given to carry out their work under acceptable conditions and finally a law must be prepared that will clarify the legal position, and provide real punishment for those who erect or operate a receiving set without license.

In the spring of 1924 a new regulation like this—and yet more—appeared in the "Ordinance for the Protection of Broadcasting." It included a special paragraph that ordained punishment for the possessors of secret receiving sets if within four weeks after the

promulgation of the law, they neglected to apply for license at the German Reich's Post Office. No less than 75.000 old and young infringers seized upon the opportunity to bring their illegal sets into a legalized status, thus in the eyes of the law to escape culpability, and to acquire their own self-respect. This great operation of purification on account of the fundamental nature thereof. spread into all nooks and corners of the German state, so we might suppose that it would put an end to the trouble of illegal listeners, outside of a few hopeless cases, once for all. This was the case in England. Should it be otherwise in Germany?

Unfortunately, these expectations were not realized. After a few months certain indications caused the suspicion that the foolish "bootleg" hearing was again beginning to spread far and wide. This time, extenuating circumstances did not favor the transgressors. Information from the police indicate that the evil is not rooted out today. Ignorance of the law after long repeated announcements in word and writing can no longer be cited as the cause of anyone's evasions. Even the amount of the license, which is reduced to two marks (50 cents) a month, can scarcely be an inducement for violating the law. Besides, the regulations for registering as a licensed participant are made very much simpler, so that the busiest person has no further grounds to evade the law on account of difficulties of registration. The

The Situation of German Listeners

FOR American readers the accompanying article makes amazing and most humorous reading. At first it might be thought that this was the outburst of a fiction writer. On the contrary, it is a verbatim translation from the German radio magazine, Der Deutsche Rundfunk. The article appeared in their issue of January, 1925. We are reproducing the article merely to show how radio enthusiasts fare in other countries.

their issue of January, 1923. We are reproducing the article merely to show how radio enthusiasts fare in other countries. In most of the European countries radio still is "Verboten." The short-sightedness of some of these European states is simply astounding. When it is considered that in the United States during 1924 over \$350,000,000 in radio material was sold, enriching the country tremendously by this new industry, it seems nothing short of suicidal for the countries of the Old World to assume such archaic methods.

The tax collected from radio listeners, we are sure, must prove a tremendous detriment to the development of the art and, as the accompanying article shows, the most rigid laws do not seem to curb bootleg receiving stations.

The United States derives its income from the radio industry by means of the income tax, because the more business done by the industry, the better the Government will fare. But the European governments evidently desire to collect the tax not only from the manufacturer but from the individual as well. This, in the past, has proven nothing short of disastrous, because the European countries are far, far behind the United States in either the manufacture of instruments or number of radio

listeners. And for every one of the European broadcast stations, the United States has ten.

We were not always free in America, either, for that matter. The writer remembers well his fight in 1912 to have the radio amateur recognized, and how, finally, part of an editorial in his magazine, MODERN ELECTRICS, became incorporated into the Radio Act of 1912, giving the American amateur rights that he did not have before.

Later, in 1919, other attempts were made to curb the amateur, notably the famous Alexander Bill. This bill was not acceptable to the radio fraternity nor to the writer, who, as editor of the ELECTRICAL EXPERIMENTER—the forerunner of RADIO NEWS—caused to be sent to the authorities in Washington several hundred thousand letters from radio amateurs scattered all over the country. A cartoon of that period (February, 1919) appears on the opposite page.

It is needless to say that the Alexander Bill never passed. If it had, the chances are that radio in the United States would never have attained its present extension.

The cartoon is chiefly interesting because it was published by the writer in 1919, long before the German, and for that matter, before all the other European radio laws went into effect. Some day the European radio broadcast listeners and radio amateurs will wake up, organize and demand a free ether. Not until then will radio in Europe expand.

HUGO GERNSBACK.

need of radio investigators from the technical standpoint which formerly so often was the inciting cause of their desire to work for the benefit of all receivers, what of this?

Even this reason disappears since the legal permission to construct one's own detector and the regulation of the amateurs' operations gives to everybody the opportunity to bring out his knowledge and capabilities in a legal way. Nothing else remains except dishonorable motives, the joy of the ill-disposed, the desire to enjoy without pay where others pay, the well-known desire to beat the Government out of what really ought to go to it.

A QUESTION

Should the Government pass unchallenged these illegal actions and allow them to gain further ground? Should it permit this structure built up by assiduous work to be undermined, that from day to day a widespread net of secret radio receivers extended further and further—which might, eventually—its extent not being known, become the greatest danger for the Government?

The microphone of the broadcast station gave the answer, when, in the second half of October, it was announced to audiences of hundreds of thousands, that the war against secret broadcast receivers was to be taken up with all might and that the German Post Office for this purpose had notified their branches in future, in every case of the discovery of unlicensed receiving sets, to mete out the fullest extent of punishment, with the tearing down and confiscating of the secret sets. Not once, but a number of times this warning was broadcast and simultaneously by notifications was spread abroad in the technical press and in the daily papers, so that every illegal hearer undoubtedly received full notice and knowledge that the day of mercy was over.

Have all broadcast "wild men" (funk-

Have all broadcast "wild men" (funk-wilder) taken note of the meaning of these announcements? No! Numerous court proceedings show it. He who follows the daily papers and radio magazines carefully will know full well that within a few weeks, since this proclamation, already over 100 court sentences have been pronounced, and several infractors sent to prison.

Certainly this strong-armed action will in the course of time bear good results and will repress the rail-birds. But is it not a sad sign of the times that so many people, and among them many who are otherwise considered good citizens in their daily lives, must, by police and governmental power, be forced to give up their light-fearing work, although they know what the consequences are? Should we not have a citizen-like feeling, that in our Fatherland, struggling hard and depending on itself alone, the private person is of less importance than the community at large? In the immense Hall of the Great German Radio Exhibition, in every radio exhibit which shall show and has shown what German technical industry and the German power of work have brought about, the walls are hung with numerous placards with a few words, "Illegal Hearing Is Theft" (Schwarzhören ist Diebstahl). Many read the warning; many will take it to heart. But only when the meaning of this sentence has come to the cognizance of cverybody, who now is fishing in murky waters, when every illegal hearer clearly knows that his action is a rotten, despicable one which injures the people at large, then only will it first be possible to root out the illicit hearing completely and radically.

WHAT is the remedy for the European situation as pictured herewith?

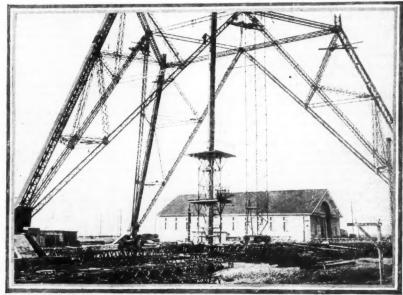
Radio News suggests that the same ideas as were used in 1912 by American radio amateurs and by the present publishers of Radio News to effect a free ether for the various European countries be adopted.

There was a time when it was not lawful in either France or England for any amateur to transmit code. It took a long fight to convince these two governments that they should allow transmission by their subjects. The right to transmit was won by the amateurs through their combined efforts and through correct organization of their radio clubs.

correct organization of their radio clubs.

It seems to us that if the European radio editors would form broadcast listeners' clubs throughout their countries and call for membership, it should not take very long to get enough petitions to have their governments take favorable action. If there are enough petitioners, no government can long overlook the wishes of a great majority of their subjects.

The United States has proven that radio broadcasting can attain unprecedented proportions without burdening the listener with (Continued on page 2185)



At least, Germany is not asleep in the matter of erecting broadcast stations. Above is a view of the base of a new tower—to be 800 feet high—of a new Berlin atation.

YE DEER PEEPUL

Radio and the Copyright Problem

By HIRAM L. JOME

Mr. Jome, of the economics and sociology department of Denison University, explains lucidly the present status of the fight between the broadcasters and music publishers.



HE founders of our government saw that in order to have a strong development of American culture and science ment of American culture and science it was necessary to protect the property rights of authors and inventors. Therefore, they inserted in our Constitution the following section: "[Congress shall have power] To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive with the Abert respective writings and disright to their respective writings and dis-

Several points must be noted concerning this provision. In the first place, copyright is not a natural right, like life and liberty. Though Congress has acted under this enabling clause with acts and amendments protecting the work of an author, still it may withdraw this protection at any time without doing violence to the Constitution.

The section says "May."

In the second place, though this section

is undoubtedly for the benefit of the indi-vidual, the public interest is paramount. Under the United States Copyright Act,

approved March, 1909, the author, dramatist composer or other person entitled to such protection, is given, among other privileges, the exclusive right to print, reprint, publish, copy, vend and translate the copyrighted work, as well as the exclusive right to publicly perform for profit.

"PUBLICLY PERFORM"

The big issue arises as to the meaning of the exclusive right to publicly perform for profit. What is a public performance? What is a performance for profit?

"A performance is public," says Arthur W. Weil, in his "American Copyright Law," "when there is present a sufficient number of the public who would, presumptively, also go to a performance licensed by the author, as a commercial transaction, so that it may be said that, theoretically, at least, the author has sustained a monetary loss.

A large number of questions immediately A large number of questions immediately suggest themselves: If I buy a phonograph record, on which a royalty of two cents has already been paid to the owner of the copyright, what rights have I? I may certainly play it on the victrola by myself. I may play it in the presence of members of my family; I may invite in a few neighbors and relatives to hear and enjoy the new selection. I may announce a housewarming selection. I may announce a housewarming and invite the entire community to my house and then play the record for the entertainment of my company

Now, suppose I buy a hotel, restaurant or movie theatre. I play the victrola in the dining room of the hotel or auditorium of the theatre. I charge for the meals or for admission to the theatre. The music forms admission to the theatre. The misic forms a part of the dinner. May I play this record without incurring further liability to the owner of the copyright? Exactly where does private performance end and public performance begin? When does a performance become one for profit?

Suppose now I played this new record into the microphone of the transmitting ap-

paratus of a broadcast station, which sends the music out upon the waves to an unseen audience of thousands scattered over a wide Is it a public performance? If the reader will visualize these situations, he will understand the crux of the

copyright problem.

The Federal Courts have for some time been grappling with these questions. The been grappling with these questions. The Shanley Company conducted a public restaurant in New York City. Songs were sung and music was played for the entertainment of the patrons. The diners, of course, paid for their meals, but there was no direct charge for the musical entertainment. The song, "Sweethearts," was sung in this place. The owner of the copyright asked for an injunction restraining the proprietor for an injunction restraining the proprietor from having this song rendered, claiming

The fight between the music publishers and the broadcasters is just another case of squeez-ing the public, helpless between them. that his property rights were being invaded.

that his property rights were being invaded. In the lower Federal Courts the author failed to get relief on the ground that, since no admission was charged, there was no public performance of "Sweethearts" for profit.

The author appealed the case, however, and it finally reached the Supreme Court for final decision. This Court, speaking through Justice Holmes, said in part: "If the rights under the copyright were infringed only by a performance where money is taken at the door they are very imperis taken at the door they are very imper-fectly protected. Performances not different in kind from those of the defendant (the restaurant owner) could be given that might compete with and even destroy the success of the monopoly that the law intends the plaintiff to have. It is enough to say that there is no need to construe the statute so narrowly. The defendant's performances are not for charitable purposes. They are part of a total for which the public and the fact that the price of the whole is attributed to a particular item which those present are expected to order, is not impresent are expected to order, is not important. It is true that the music is not the sole object, but neither is the food, which probably could be got cheaper elsewhere. The object is a repast in surroundings that to people having limited powers of conversation or disliking the rival noise given between the hard from give a luxurious pleasure not to be had from eating a silent meal. If music did not pay, eating a silent meal. It music did not pay, it would be given up. If it pays, it pays out of the public's pocket. Whether it pays or not, the purpose of employing it is profit, and that is enough." And he therewith reversed the decision of the lower Court.

A certain theatre owner employed a pianist to play appropriate music at his movie performances. The pianist was given discretion as to what selections he should perform. The pianist played "Tulip Time" from "Ziegfeld's Follies 1919." No charge was made for the music, but a charge, of course, was made for admission to the theatre. The owner of the copyright sought an injunction restraining the theatre owner from playing this selection. The Federal District Court granted the injunction, hold-ing that the playing of copyrighted music by a pianist in a picture theatre was an infringement of the copyright.

COPYRIGHTS AND BROADCASTING

With the advent of radio broadcasting it became necessary for these stations to furnish music for the musicians to send out upon the air. It would conceivably be possible to make up a good popular program from the free list (on which copyright (Continued on page 2166)

Don't Believe It

By JAY HOLLANDER

Here are presented some interesting facts on a phase of radio not often discussed. It sounds a warning as well as giving a laugh.

HAT sins are committed in the name of science! With every advance that is made, 17 mounte-banks and fakirs immediately rush out, figure some way of using it to their own ends, and go forth in the highways and byways seeking whom they may devour.

F you have friends who wish to invest money with questionable apparatus, hand them the accompanying article. Radio readers can do a vast amount of good in educating their less technical friends.

In the meanwhile, for publishing the In the meanwhile, for publishing the article on the Neurophonometer, "Dr." George D. Rogers has sued Radio News for one million dollars in the courts of San Antonio, Texas. If Mr. Rogers ever collects his million dollars, or any part of it, we promise him that we shall peddle his Neurophonometers for the part of our lives. meter for the rest of our lives.

When the article first appeared, "Dr." Rogers sent the Editor a letter from which we quote the following:

"I am very anxious that this instru-ment shall be sold on merit alone, so I hereby accept your challenge, so that I may have the opportunity of demonstrating it to you that you and the Board (composed of physicists, physicians and radio engineers) may have the opportunity of knowing the exact work done by it.

"I only ask that the investigation be made in accordance with accepted laws of physics. In other words, all I ask is a fair chance with physicists, physicians and radio engineers, and the X-ray to demonstrate to Chiropractic contentions.

"I am thoroughly convinced that I have a thoroughly scientifically constructed and operated instrument, that does all that we have claimed for it to do; if I have not I would be glad to learn different, You are quite sure that I have not; therefore, I am glad for this opportunity of learning from men of unquestionable authority which

men of unquestionable authority which of us is right.
"I am so sure that you are a big, broad-minded man, and that the provisions I ask are perfectly fair and agreeable with you, that I am starting arrangements so that I can come to your city, whenever you designate.'

Upon receipt of this letter, RADIO News put it up to Mr. Rogers to name his own time, giving us two weeks advance notice of his coming. Aladvance notice of his coming. Although we have been patiently awaiting the arrival of Mr. Rogers, he seems to have had a sudden change of mind, sending the notice of the milion dollar suit to New York in lieu of himself, the reason, of course, being that he had to save his face in his community, and thought this ways. community and thought this was a cheap way of getting out of it.

Our invitation is still open, and Rogers has confirmed our opinion of him by not coming to New York, although he promised to do so. We are still waiting.

—Editor.

Their scientific adaptations are worthless except to line their own pockets with the dollars of the gullible ones who work harder with their hands than they do with their brains and common sense.

It is worse than even the estimable Barnum thought. There is not only one born every min-

ute, there is one fleeced also.

In every branch of science there has been this regular fleecing of the people who read the Sunday supplements telling of the wonders of the latest developments of the serious scientific investigators. They read these more or less lurid accounts of the latest miracle of the laboratory and test tube, but remember nothing of the account except the dreams of the newspaper hack which were injected into the reports of the scientist in order to get the account past the editor and to give room for striking illustrations

The net result is that the reader has an idea that the novel discovery-usually touted as the savior of the world which will do everything from curing tuberculosis to shining the nickel on the kitchen stove—is a great miracle of science and capable of all the results postulated for

So the gentlemen of the large diamond stud and the sleek hair have their market all ready for them. Their work is simple, the usual procedure being somewhat as follows: They have a piece of the apparatus

buy a piece of the apparatus, remove it from the case it was housed in at the fac-tory and place it in another with a number of added controls; then they install several blue, green, red and yellow lights, for the purpose of making the ensemble more awe-some, and go out and begin to heal the diseases or solve the problems of the world.

Radio has probably grown a larger crop of these particular gentry than any other science. This is so probably because it is a bit closer to the ordinary idea of the occult than any of the others. No matter how the details are explained, there is still the fact that the waves travel through the something called by consent, the ether. And the most anyone knows of this stuff is that it goes through glass and is where even air isn't. This point makes the whole situation sort of eerie to the everyday man in the street, who is accustomed to the realities corned beef and cabbage.

So when he reads of a scientist who has cured a sort of cancerous growth on a geranium by means of a sort of short wave radio set, after he has seen the imposing before and after photos, he is thoroughly convinced that science has made another stride. It takes, therefore, very little persuasion on the part of a well-dressed, seemingly prosperous man to convince him that investment in the new Radio Cancer Hospital will be a short cut to a five figure bank account. "For," says he of the prosperous look, "do we not control all rights to the use of short waves to cure this dread disease for which

THE STATE OF TEXAS, } The State of Team to the Sheriff or may Constable of Seas County-GREETING:
YOU ARE HEREBY COMMANDED to sermon EXPERIMENTER PUBLISHING CO. . a corporation, of which Harvey Steele is local agent, next Regular Term of the Honoruble District Court of the 37th Judicial District of Texas in and for Strain ment English Trom of the Managhab District Count or your curves. Proceedings on the first Managhay in JASS.

A D 1925 the Naminor land of the City of San Administration on the first Managhay in JASS.

A D 1925 the Name Fording the Sight day of JASTUMATE, A D 1928 them and directly account particles fold on and Court on the 172th day of December.

A D 1924 or a work numbered on the Dorket of said Court No B- 38,496 Whereis EXPERIMENTER PUBLISHING CO., a corporation, of which Harvey Steels is local agent, and Harvey Steels, individually, are the store of the Provide's demand tong minimath to police, new:

A seak for of demanges in the war of \$1,000,00,000 being \$500,000,000, one that and \$500,000,000 seeps are not seen as a second of the plaintiff by reason of the notice of the defendants, who, cometine was the plaintiff by reason of the notice of the defendants, who, cometine wantenly, wickedly and with the intent to injure the good name; fame, character and reputation of plaintiff, side publish, print and consent to be published and printed in the Haddo News, a magazine published and control of the plaintiff and a certain the publish and consent to be published and printing that the published and published and consent to be published and published to consenting this plaintiff and a certain instrument, however by consenting this plaintiff and a certain instrument, however by the published and the consent of the published and the publis HEREIN FAIL NOT, but have you before said Court, on the first day of the naxt sea, showing how you have executed the same. WITNESS: OCCEDIA ARCHER, Clerk of the District Courts of Beans C San Assenio, this the 17th, day of _ December A. D 192 4m Country the Detrice Country Descar, Country, Texts.

A Million Dollar Suit

Our readers will remember the famous "Dr." Rogers' Neurophonometer, which we exposed in our December, 1924, issue. At that time we made a \$1,000 challenge to demonstrate the Rogers Neurophonometer before a body of twelve scientists. If these twelve men decided that the Neurophonometer claims were founded upon scientific truth, Rapio Næws was to pay Rogers the sum of \$1,000, plus transportation to and from New York.

Although Rogers promised to come on to New York, he evidently had a charge of heart, and, in order to save his face in his community, started his million dollar suit, facsimile of which appears above.

physicians have been seeking a cure vainly for, lo, these centuries past?" Now the fact that the scientist was work-ing toward an end and was writing simply his early experiments did not seem enter the head of the man asked to buy. The scientist was absolutely correct in his assertions, but his claims were nothing like those of the salesman. There is a deal of difference between a geranium and a human being!

And it is convincing enough to send him And it is convincing enough to send him home for a hurried conference over the dinner dishes with his wife. The result is that he gets a finely engraved certificate with a lot of extra fine printing and a gorgeous gold seal—and a bit of costly knowledge as to the character of "science" in particular and salesmen in general.

And the worst part of it is that his own disappointment at being skinned—to use the good old Anglo-Saxon—causes him to immediately reach the conclusion that all science is on the same order, viz., something which will allow slick city salesmen to make a living at the expense of the hard-working man. So advance of the art is hindered.

For several mouths past there has been a small but very pretentious show room and suite of offices situated on one of the ave-York City. The sole purpose of the men in this office and of the grand and complicated—and always well polished—apparatus which line its walls, is to convince the ever invisition and analysis analysis and analysis analysis and analysis analysis analysis and analysis analysis analysis analysis and analysis analysis and analysis a quisitive and anxious public that a few radio

(Continued on page 2126)

History of Radio Inventions

By A. H. MORSE, A.M.I.E.E., Member I.R.E.*

INTRODUCTION

The term "Radio" is used herein to connote radio telegraphy and radio telephony,

not merely broadcasting. The bibliography of radio is already very extensive, and while it contains much of a trashy or partisan order, the balance very well covers the technical aspects of the sub-ject to date. There should, however, be room for a book which presents the subject in a novel or more lucid way, or for one that considers it from a new point of view; and it is in the latter class that it is hoped that

this book will find a place.

Within the last few years the radio field has been invaded by many thousands of per-sons who know nothing of its evolution, and are therefore sometimes unable to distinguish between what is new and what is old. The consequence is that they waste much time and money in re-inventing old devices, and in evolving others to circumvent imagined patents on inventions long since in the public domain. The case of the spider-web coil may be cited as an example. This will be found to have been illustrated and described several years before the Great War, but was heralded as a novelty two or three years ago. It is one of the author's objects to help to correct the perspective of these newcom-ers; and it is hoped that this book will be of some assistance also to British and Amer-

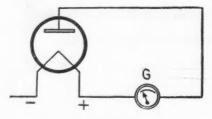


FIG.1 Edison's original diode patented long before the advent of radio.

ican Patent Agents and Attorneys (new to the art), Inventors, Experimenters, Journalists, Radio enthusiasts and "Whymen" generally, on both sides of the Atlantic.

The evolution of the radio art is traced

herein, mainly through the patent office records of inventions in use today, or their lineal forebears. As a consequence, many inventions of great merit and one-time promise receive little or no mention; and, except in a few cases, where inventions are cited merely as evidence of the contemporary knowledge of the art, the selection has been made, not by the author, but by the test of utility. It may be observed that this test has proved too much for some of the most heralded inventions.

Since so much reference is necessarily made to patents of invention, it may be well to warn the reader that an invention is not always novel, useful or practicable because

patented.

While the loose practice of using the words "took out a patent," instead of "was awarded a patent," is to be unequivocally condemned, it must be admitted that the former often express a near-truth, particularly in connection with a new art, and in certain

Patent Office Examiners are only human, and when they accept an application for a patent, it merely means that they know of, and have succeeded in tracing, nothing to upset the inventor's claims. Of course, in

VE are happy to present to our readers a new and important work, entitled "History of Radio Inventions," by A. H. Morse, which is beginning in this issue.

This book, which is now running serially in RADIO NEWS, will be published afterwards in book form, in both the United States and

It will prove a gold mine to those interested in the history of all important radio inventions and will serve as a reference book to invenand experimenters in the future.

Mr. Morse has been careful to give every patent number throughout the text, as well as all refer-ence data, so anyone interested in any particular phase of radio de-velopment will have little trouble in locating important data.

-EDITOR.

large settled countries, where there are spe-cialist examiners for every art or branch of an art, a patent has more than it has in a new or undeveloped country, where a few examiners have to deal with applications for patents in relation to all the arts. Moreover, it is a fact that, until a few years ago—and perhaps they exist today—there were administrations which would, and often did, take an "inventor's" money for a patent on a "perventor's" money for a patent on a "per-petual-motion" or "self-driving" machine. The U. S. Patent Office requires a working model with such applications, which is equivalent to refusal.

alent to retusal.

In any country a patent of invention is merely a "scrap of paper" until it has been supported by a law suit; and it is a wise inventor who knows whom to sue. Being blind, justice is only too liable to be influenced by a cloud of "expert witnesses," the which cost much moved.

the which cost much money.

If over much attention appears to have been given to the arc, it is because, by rea-son of its simplicity and freedom from patent restrictions, it may continue to have extensive application; even if its present disabilities are not mitigated, which is unlikely. (There has been some improvement since this was written.)

In the hope that he may thereby help to correct some of the misapprehensions to which expression is so persistently given in the lay press, the author has ventured to look forward a little, and to hazard some

opinions on the lines of future development.

Wherever the British or American—as the case may be—"equivalent" of a patent is known to the author, reference is given to it herein. It must not be assumed, however, that such "equivalent" covers the same patent protection in the two countries; because, in many cases, there is a wide discrepancy in this respect. When a patent crepancy in this respect. When a patent number is prefixed (or suffixed) by (?), it means that the author has not personally verified the reference.

The author is gratefully indebted to the courtesy of the Commissioner of Patents at Washington, D. C., and to the Controller of His Majesty's Stationery Office at London, for permission to reproduce the extracts from American and British patent specifications respectively, which appear herein; and

to the Director, U. S. Bureau of Standards, for the photo and diagrams illustrating the chapter on Beam and Short-wave Radio.

The author's thanks are also due to Messrs. E. A. B. Snoaden, H. F. White, H. R. Rivers-Moore and R. E. H. Carpenter, of London, for assistance in procuring reference to certain publications, not available in Montreal; and to the publishers for their courtesy and kindly advice on the arrangement of the subject matter.

Montreal, December, 1924.

CHAPTER I THE PAST

N connection with patents of invention, there is a somewhat commonly used metaphor to the effect that one cannot get a patent on the use of an umbrella to keep off the sun. This, however, cannot be said to apply to the radio art; for instance, J. A. Fleming was awarded a perfectly good patent on the application to radio of a well-known effect and instrumentic. tality; and H. H. C. Dunwoody secured an equally good one on the similar application of a hitherto unsuspected property of car-borundum. In each case the invention was of a high order of commercial utility, since the former led to one of the greatest developments in the evolution of the art, while the latter sustained the art during one of the most needy periods of its application to com-merce, and is still in extensive use.

evolution of radio has been characterized by comparatively few original inventions of outstanding merit and commercial utility; and by fewer still that, for one reason or another, have found any practical application, until they were about 10 years old. Moreover, the borrowings from other arts have been all too few and tardy.

In this chapter we will endeavor to note in chronological order the discoveries and inventions which are more or less strictly relevant to the present state of the art; omitting those which have or had no im-portant practical application, regardless of their academic merit,

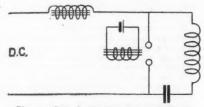
1678. Christian Huygens, a Dutch mathe-

matician and physicist, propounded the undulatory theory of light.

1843. Professor Joseph Henry communicated to the American Society that he had succeeded in magnetizing needles at a distance of 220 feet. tance of 220 feet.

1867. Ruhmkorff perfected the "Ruhmkorff coil" which 35 years later was used almost exclusively in wireless stations.

Clerk-Maxwell propounded



This is the forerunner of all the present-day arc transmitters.

electro-magnetic theory of light. This theory confirmed and extended that of Huygens, and was supported by mathematical proofs which form the basis of radio engineering

1879. 1879. Professor D. E. Hughes, of London, gave a private demonstration of the

*Late Supt. Dom de Forest Wireless Telegraph Co. and United Wireless Telegraph Co.; Engineer, Marconi's Wireless Telegraph Co.; Wireless Adviser, Indo-European Telegraph Co.; Managing Director, Marconi Wireless Telegraph Company of Canada.

transmission and reception of radio signals up to a distance of several hundred yards. Those present were W. H. Preece, Sir. Wm. Crookes, Sir W. Roberts-Austen, Professor W. Grylls Adams and Mr. W. Grove. Early in the following year Professor Hughes gave a similar demonstration to a professor of Cambridge, who stated that all the phenomena could be explained by known electromagnetic induction effects. This so dis-couraged Hughes that he decided not to publish the results of his experiments until he was in a position to prove that he was making use of hitherto unknown phenomena. Consequently, his experiments were not made public for many years; meantime the phe-nomena had been identified by others, and commercially applied by Marconi. In 1899, in commenting on Hughes' work, Sir Wm. Crookes said: "It is a pity that a man who was so far ahead of all other workers in the field of wireless telegraphy should lose all the credit due to his great ingenuity and prevision." In later years Hughes might and prevision." In later years Hughes might have had recognition of his work, but he resolutely refused. 1883. Professor A. E. Dolbear, of Bos-

ton, evolved a system in which he proposed to use an elevated aerial, earthed through the secondary of a Ruhmkörff coil, having a telephone transmitter and battery in series with the primary. He also proposed in 1886 to elevate his aerial by means of a kite and to put a Morse key instead of a telephone ransmitter in the primary circuit (see U. S. Pats. 350,299 and 355,149), which were acquired by the United Wireless-DeForest

Company.

Thomas A. Edison, of New Jersey, applied for an American patent on a diode for use in the voltage control of electric lighting systems. (U. S. Pat. 307,031.) This invention caused considerable scientific inpractical application. (See Proc. Royal Society, London, Vol. xlvii, 1889-90, p. 118, J. A. Fleming.) (Fig. 1.)
1885. Edison proposed the use, in an in-

ductive system of wireless telegraphy, of an elevated and earth aerial for land stations, and an inverted and earthed "L" aerial for ship stations. (Fig. 2a, b, c.) (U. S. Pat. 465,971.) He also proposed the use of balloons covered with conducting foil and connected through transmitting or receiving apparatus to earth. (Fig. 2d.) 1888. Professor Rudolf Heinrich Hertz,

German, demonstrated experimentally the possibility of creating electro-magnetic waves in the ether, and confirmed their identity with those, which according to Clerk-Maxwell's theory, were the conveyors of light.
Apparently Hertz was unaware of Hughes' earlier experiments with a microphonic detector and a telephone, because he (Hertz) used for a detector a simple metallic loop containing a minute spark gap. Hertz suc-ceeded not only in detecting the waves, but in measuring their velocity and length. He also demonstrated that they were capable of reflection, refraction and polarization. 1890. Professor Edouard Branly,

1890. Professor Edouard Branly, of Paris, found that a "coherer" was a detector of Hertzian waves. The "coherer" effect had previously been noted and commented on by others, and it had been used by Hughes in his unpublished experiments of 1879. Although it was known at this date that the filings or granules could be decohered by tapping, no automatic provision seems yet to have been made to this end; and it was not until 1897 that Lodge disclosed that when used with a telephone, a filings 'coherer" did not require to be tapped.

It is related that, in the course of some experiments to ascertain the conductivity of an iron chain under various degrees of tension, Branly noted sudden current rises, for which there was no apparent reason. In the course of his inquiries for the cause, he discovered that in another part of the building a person was making simultaneous experiments with a Ruhmkorff coil, and that—as we would now expect-there was a current rise in the chain each time the coil came into operation. The writer has not been able to

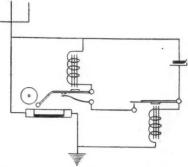
verify this story. (Branly received the Nobel Physics Prize in 1921 for his researches in

Radio.)

Professor (now Sir) Oliver Lodge published the results of his researches and experiments in electrical resonance or syntony, and explained that a closed oscillatory circuit was a feeble radiator and a feeble absorber.

1892. In the course of a paper in the Fortnight-ly Review, in February, Sir Wm. Crooks said: "Rays of light will not pierce through a wall, nor, as we know only too well, through a London fog; but electrical vibrations of a yard or more in wave-length will easily pierce such media, which to them will be transparent. Here is re-vealed the bewildering possibility of telegraphy without wires, posts, cables or any of our present costly appliances. Granted a few reason-able postules, the whole thing comes well within realms of possible lment. At present fulfilment. present experimentalists are able to generate electric waves of any desired length, and to keep up a succes-

sion of such waves radiating into space sion of such waves radiating into space in all directions. It is possible, too, with some of these rays, if not with all, to retract them through suitably shaped bodies acting as lenses, and so direct a sheaf of rays in any given direction. Also an experimentalist at a distance can receive some, if not all, of these rays on a properly con-stituted instrument, and by concerted signals messages in the Morse code can thus pass from one operator to another. . . . At first sight an objection to this plan would be its want of secrecy. . . . This could be got over in two ways. If the exact position



The original coherer with an automatic herer as devised by A. S. Popoff.

of both sending and receiving instruments were known, the rays could be concentrated with more or less exactness on the receiver. If, however, the sender and receiver were moving about, so that the lens could not be adopted, the correspondents must attune their instruments to a definite wave-length, say, for example, 50 yards. . . Even now, indeed, telegraphing without wires is possible within a restricted radius of a few hundred yards, and some years ago I assisted at experiments where messages were transmitted from one part of a house to another without an intervening wire by almost the identical means here described." (A similar suggestion is reported to have been previously made by Professor R. Threlfall, of suggestion is reported to have been previously made by Professor R. Threlfall, of Sydney, Australia.)

Professor Elihu Thomson, of America, applied for a patent on an arc method of pro-

ducing high frequency currents. His invention incorporated a magnetic blowout and other essential features of the arc of today, but the electrodes were of metal and not inclosed in a gas chamber. (See U. S. Pat. 500,630.) (Fig. 3.)
1893. Nikola Tesla lectured before the

Institution of Electrical Engineers in London on "Experiments with Alternating Currents of High Potential and High Frequency," wherein he disclosed ways and means of generating the currents that were required for radio telegraphy.

1894. Professor Oliver Lodge transmitted

and recorded signals across a distance of

60 yards. 1895. Professor A. S. Popoff, of Russia, used a coherer in series with an elevated aerial and ground, with a recorder in shunt with the coherer, for the purpose of study-ing natural electro-magnetic waves or "at-mospherics." His coherer was fitted with an automatic tapper. Commenting upon his experiments (in December, 1895), he said: "I entertain the hope that when my appa-"I entertain the hope that when my apparatus is perfected, it will be applicable to the transmission of signals to a distance by means of rapid electric vibrations—when, in fact, a sufficiently powerful generator of these vibrations is discovered." (Fig. 4.)

1896. In June, Professor Ernest Rutherford, of Cambridge, succeeded in receiving

signals over a distance of half a mile. In place of a coherer he used a magnetic detector of his own invention.

(Continued on page 2188)

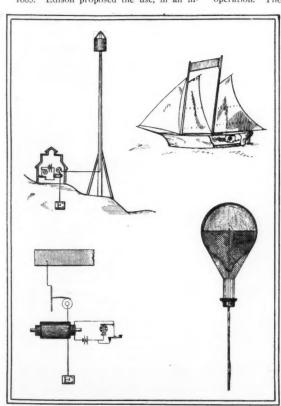


Fig. 2. Showing three antennae which Edison proposed using.

Radio In 1935

By HUGO GERNSBACK

Member American Physical Society

HERE is today a science which may be termed the Science of Prediction. In former years one had to be a prophet to make predictions, whereas in these enlightened days it would appear that even the best historical prophets of antiquity were in reality but good scientists themselves. In other words, these worthy themselves. In other words, these worthy individuals had mastered the science of prediction themselves and by putting two and two together they often achieved remarkable results which, to the superstitious populace, seemed supernatural.

Any good astronomer today can predict with exactitude the solar and lunar eclipses for the year 1935 down to a small fraction The mean average temperature of a minute. for the United States can now be calculated months ahead, due to recent studies of

solar activity.

When it comes to predicting what radio will be in 1935, it is not necessary to make wild an improbable guesses, but by follow-ing certain laws and by building upon what has been accomplished for some years back, we can readily arrive at a result that will

be fairly accurate.

When the writer compiled his book on the radio telephone, in 1910, the first of its kind to be published anywhere, entitled, "The Wireless Telephone," he made certain statements therein, which he believed sound in riew, of the then prevailing wireless art.

The preface of this book is printed on this page. The writer was criticized quite a good deal, and called visionary and a dreamer by many at that time; the predictions, nevertheless, not only came true, but proved far too tame, and not visionary

enough to compete with the events that actually took place later on.

So when the writer sets himself the task of predicting the advance in radio in the year 1935, he no doubt will be ridiculed again. Nevertheless, the statements that follow hereafter are probable to the statement and the statements that follows hereafter are probable to the statement and the statement an ably entirely too conservative, and with 10 years, far more impossible things will have come about than those mentioned in this article.

MORE STATIONS

At the present time there are nearly 600 broadcast stations operating in this country, but we have only 150 channels in which to operate them. That means that some of the stations have to share time with others, to give them all a chance to get on the air, while some must be so far removed as not interfere with

This is a very unsatisfactory state of affairs, and the writer has pointed out a number of times before that the only solution is to reduce the wave-length for all broadcast stations. It is the writer's firm belief that in 1935 all broadcast stations will operate below 50 meters, possibly below 10 meters. At such low wave-lengths the frequency

incre ases so rapidly that 10,000 stations can be separated 20 and m o r e kilocycles without inter fer-

ing with ing with each other. 'The word "wave-length" will not be used in 1935. Rather, stations will all be known to operate under so many kilocycles, or perhaps, myriacycles (kilo meaning 1,000 — myria, 10,000). Operating at 25 meters or below, we could immediately a could be could below, we could immediately accommodate, even today, thousands of extra broadcast stations, which would not interfere with each other in any way whatsoever. The reasons why it is not done at the present time are various.

LOSSES

Suppose one of our popular broadcast stations were to suddenly drop to 25 meters. No broadcast receiver made today could receive at such a low wavelength, because modern receivers are made to operate on a wave-length between 200 and 600 meters, or thereabouts. The writer makes the prediction that

during the next few years the popular broadcast receivers will be those which will be able to tune down lower and lower. Already broadcast stations are beginning to go down in the wave band. Of course, this movement is gradual, as it should be. Such changes take time, which is a good thing, because if the changes were made overnight, all present broadcast receiving sets would be obsolete. By building better receivers to operate at lower and lower wave-lengths, each year will show an improvement over the past one, and soon we shall have nothing but low wave receivers.

At the same time the sensitivity of our sets will keep on increasing, as it has during the past 10 years. The greater amount of losses having been done away with, the efficiency having been increased, it stands to reason that the sensitivity of the set will be increased as well.

While the writer believes in the present cycle of super power, he does not believe that it will prevail in 1935, for the following simple reasons:

When Marconi first started sending across the Atlantic Ocean, it took 50 kilowatts or 67 horsepower to accomplish the feat. Most of this energy was wasted, and only a very small fraction arrived at the other side of



Above is shown the tentative radio set of 1935. Here we have radio television combined with radio broadcast. Instead of using a number of dials as we do today, the user of the future radio set will have a small pear, as shown. Pressing one of the buttons revolves the pointer slowly until you get the station you desire. Releasing the pressure on the button puts the station too no the loud speaker and a television apparatus begins to function at the same time. Pressing the other button wil bring in foreign stations located on the inside circle, using the same pointer, the operation being identical in all cases. Separate loud speakers can, of course, be used in this set, or the screen itself upon which the televison picture shows may become the diaphram for the loud speaker.

Breface

The present little volume is intended for the experimenter doing research work in wireless tele-phony and the student who wishes to keep abreast

phony and the student who wishes to keep abreast with the youngest branch of the wireless art. The author realizes that the future use of the wireless telephone will be confined to the low power or battery system, as the present instruments, neces-sitating 220 and 550 volts for their successful operation, are not desirable nor practical enough for every day use.

The wireless telephone of the future must be as flexible as the wire telephone of to-day.

Every farmer will be able to operate his wireless telephone, when the sending and receiving instruments will be housed in a box a foot square, without

depending on the lighting current for its operation.

The author predicts that in less than 10 years this stage will have been reached as it is bound to come sooner or later.

Quite a little new matter will be found in these

pages and while some old matter has necessarily appeared for the sake of completeness of the book, the author trusts that the necessity of reviewing such matter will be apparent.

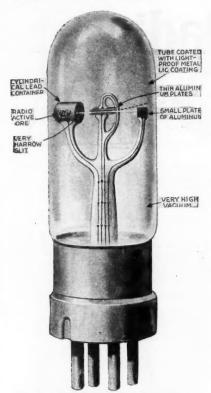
The author shall feel happy if this little volume

will be the cause to advance the new art if ever so little, and he will be pleased to bear honest criticism and suggestions as to the contents of the book.

H. GERNSBACK.

New York February, 1910.

A prediction made in 1910 by Mr. Gernsback in the original book, "The Wireless Telephone," which was the first of its kind published anywhere. The predictions shown in this book have already come true.



The theoretical cold vacuum tube of the future. Some experiments by a number of scientists have been made along these lines, and it is now thought possible that within the next ten years we shall have a tube that will not require an "A" battery at all, the electrons of the tube being supplied, not by a hot filament as at present, but by a radio-active substance, or perhaps in some other similar way to obtain the same result. No such tube has, of course, as yet been produced, the above illustration representing the artist's conception of the tube.

the ocean. Here we had wireless receiving instruments with fearful losses and the small amount of energy that came in was barely audible. On the other hand, the amateurs of today are sending messages across the ocean regularly with an energy of 10 watts, which is exactly two-hundredths of one per cent of the energy that it took Marconi to do the same thing 24 years ago. In other words, with the energy inherent in a few small ba' teries that can be easily put into a small suitcase, and which can be readily carried about, it is now possible to transmit radio intelligence across the Atlantic ocean. Again, if conditions are right, and the transmission and reception are efficient, there is no need for super power. In 1935 a 10-watt station will be heard around the entire world. Under such conditions, with ultra-sensitive apparatus, the super power system would create havoc with receiving apparatus within a distance of a few miles, and for that reason it probably will not be used at that time.

TELEVISION

In 1935 we shall have radio television. It will be possible to see, as well as to hear, by radio. An explorer will take along with him a portable radio station and he will be able to give a lecture right on the spot in the jungle in darkest Africa or up in the unexplored regions—if such there be at that time—of the Amazon. He will explain everything he sees, and his projector will also be tuned at every angle so that the listeners 10,000 or 12,000 miles away will be able to see at the same time. This television apparatus, by the way, is almost within our grasp now, thanks to the wonderful work done by C. Francis Jenkins, of Wash-

ington, D. C., and Edouard Belin, of Paris, France. The actual transmission over short distances has already been accomplished, and it remains only to put on the finishing touches.

TUBES

What tubes shall we use in 1935? The development of the vacuum tube since 1906 has been slow but steady. Since DeForest invented the Audion, much improvement has been made. We are still using the same tube with a number of refinements. At the present time all tubes are run by batteries, or, if operated from the 110-volt houselighting current, an intermediate circuit is used to step down the current to the right voltage. Within the next few years we shall have a 110-volt tube, which will operate directly from the electric lighting mains, without any resistances whatever. This will be a great step forward, but to the writer's mind this is not the final solution. Engineers are working towards a further goal, and that is a cold electronic tube; in other words, namely, no more heated filaments and no more "A" batteries. It is already possible to make an electrolytic "tube" such as was invented in Germany recently, where a colloidal liquid was used, and there is, of course, no heat in this. The electronic action is between plates and grids.

A "cold" tube will probably be used by 1935, this tube containing certain gases which may become luminous under the action of the current. These tubes will probably be used on either batteries or 110-volt current, but there will be no heating current, and such tubes, therefore, will be most economical. Even if five or six such tubes should be used, the consumption of current would be so small that it would not even be registered on the house current meter.

nouse current meter



The control of the radio receiving outfit of 1935 will be simplicity itself. We are getting away from too many controls, knobs and other handles, which long before 1935 will be obsolete. It was the writer, by the way, who, in an editorial in the February, 1923, issue of Radio News, was the first to advocate single control sets. It will have been noted that a few of these made themselves noticeable late in 1924, while 1925 will surely witness the advent of a great many single control sets, which seem to gain greater and greater favor with the public. The outfit shown on our cover illustration, as will be noted, has a single control, with a remote control added. At the present time it is necessary to jump up whenever you wish to tune in another station or whenever an adjustment has to be made. This ties down the listener to the set, which is

WOOD BACK
COVERED.
WITH SILVER
FOIL

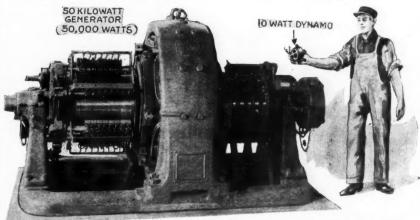
SPEAKER
IS ADJUST
ABLE TO
ALL PLANES

ADJUSTABLE

It has always been Mr. Gernsback's contention that the present loud speaker with a small diaphragm, operated on the telephone principle, is all wrong. Pictured above is theory of an electrostatic loud speaker whereby a large surface is made to vibrate on the electrostatic principle. Mr. Gernsback has himself been working on a speaker of this kind for some time and has obtained fair results. The loud speaker of 1935, in our opinion, will have a large vibrating surface instead of the small 2½ to 3 inch surface in use today.

not always desirable. The writer shows the remedy for this by having a pear-shaped control, as shown. The lady on the cover, by pressing a button, closes a circuit which automatically rotates the tuning controls very slowly or swiftly, depending upon the amount of pressure on the button. When the station desired is reached, the pointer on the dial revolves very slowly in the manner of a vernier until the station comes in loud and clear, at which the control is stopped. American stations will be found at the outer circumference, while foreign and trans-Atlantic stations are just below, in the red inner circle. By touching the second button on the pear-shaped control, the operator can, at will, bring in either foreign stations, or the stations of her own country. It goes without saying that the single control operates both the sounds from the station to be received and the television elements, both working in unison and automatically.

(Continued on page 2186)



When Marconi, 24 years ago, sent his first message across the ocean, it required 50,000 watts. The radio amateur today accomplishes the same results in a much better way by using 10 watts only; in other words, the merest fraction of the power necessary to accomplish the same thing 24 years ago. The chances are that in 1935 no broadcast station will require more than 10 watts in order to supply entertainment to listeners within a radius of several hundred miles.





ENGLAND

Novel Program

The Nottingham broadstation recently cast broadcast a lecture on economics and the stu-dents who had anything

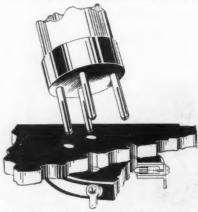
to say on the subject called the station by telephone. These calls were directly con-nected to the amplifiers and the students in this way broadcast their criticisms of the

A Good Loud Speaker

is doing good work in Glasgow after having been through fire and

A certain loud speaker It was on a ship

An English combination dial and station log is illustrated in the accompanying sketch. The station markers are slid along the slots until their arrow points to the dial setting of the station. There is a slot above and below the center of the dial so that in case stations have insufficient room for logging, because of the closeness of the wave-lengths, the indicators may be placed at the proper points.



The tube socket shown above has a novel method of getting good contact with the prongs of the tube. The small plungers that project into the prong holes are cut at such an angle that they are pushed back against the contacts when the tube is placed in the socket. When the tube is removed, the plungers return to their original positions, as there is a spring between the prong hole and the contact.

For when the boilers blew up. several months it lay in sixteen fathoms of water, but was eventually recovered by a diver, and is now the equal of new after a thorough cleaning.

2LO Has New Home

The well known station 2LO of the British Broadcasting Co. has been moved from Marconi

House to Oxford Street.
The new antenna masts are 125 feet high and of the span between the masts will be occupied by the actual antenna in order to get down to the wave-length of 365 meters. The antenna consists of two "sausages" spaced by 15-foot spreaders, each "sausage" having five wires on 3½-foot hoops. The ground connection is made directly to the framework of the building.

Radio to the Rescue

Recently Admiral Stur-dee of the British Navy was to have delivered an opening address at a ba-zaar in Birmingham. At

the last moment word was received that the Admiral could not be present, so a message was sent to the British Broadcasting Co. asking for an address by radio. The B. B. C. promptly took up the matter and persuaded Viscount Curzon to speak instead of the Admiral. The Viscount spoke from 2LO in London and his speech was reproduced by a loud speaker to the audience in the Birmingham Town Hall.

The Theatre Ouestion

American theatrical producers are not the only ones who are worried about the broadcasting of their shows. British show-

men have tried sending their shows over the air and the public liked the idea. However, as in this country, there are calamity hunters who say that radio will ruin the theatre business, totally neglecting the fact that the box office receipts took a decided jump immediately after the show had been broadcast.



JAPAN

Japan Goes On the Air

On March 1 the first Japanese broadcaster went on the air at Tokyo. This station is owned by a local broadcasting associa-tion and will carry the usual type of broad-

Another station is proposed cast program. at Osaka. Both of these stations are reported to be equipped for 750 watts power.



FRANCE

Work Started on Radio Vocabulary

At a recent meeting of L'Association de la Presse Radioelectrique in France, it was unanimously decided that the French

a standard radio vocabulary, and that a com-Radio Union should take up the question of mission representative of all branches of French radio should be formed.

CZECHO-SLOVAKIA

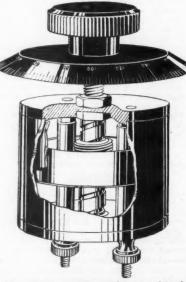
A Severe Penalty

The amazing news reaches us that a radio fan in Czecho-Slovakia was sent to prison for six weeks because he built a

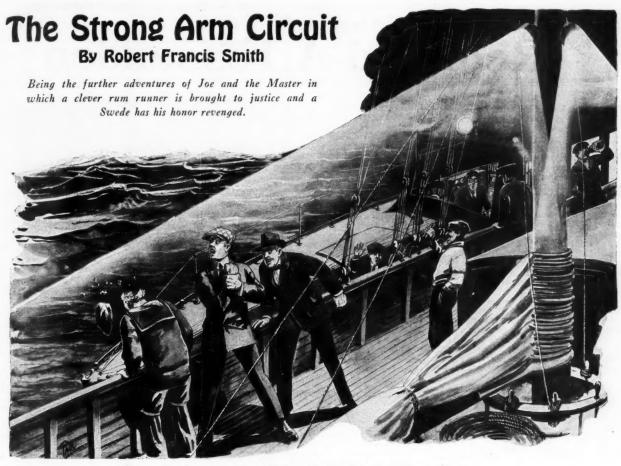
radio set and occasionally sold parts without a license.



A variometer that has self-supporting windings which are protected by a bakelite tube recently appeared on the English market. There is need for but one hole in the panel for mounting this instrument. The scale on the dial is behind the small window and the reading is indicated by the point in the frame.



The plateless square-law condenser consists of Ine plateiess square-iaw tondenset changes of two telescoping electrodes separated by a dielectric. The knob revolves twice during the entire travel of the movable electrode. As can be seen in the sketch, there is a fine thread on the screw that controls the moving electrode, so there is a vernier adjustment possible.



The plot was out when the sailor proved to be nothing more than a wax dummy.

N the spring a young ham's fancy lightly turns the dials to see what San Fran-cisco's peddling. And I got 'em, too, with a crystal set, on an express train, with a hat rack for an aerial and a car truck for a ground, on a foggy night just offa Lake Erie. Have a grin with that one! "Joe, dear," says my lost two dollars, "will

Joe, dear, says my lost two donars, war you please tune in onto some jazz program? I read KDKA's got a nice one on."

"Nice what?" I replies. "A bun?"

"Try to be normal, honey," cautions the until-breath-do-us-part. "This gang needs a little shaking un." little shaking up.'

Ittle shaking up."

The gang in question being a Pullman load of vaudeville actors, New York-ward bound and happy therefor, although half of 'em ain't got a split week between them and the bread line. Me and Doris, being headliners in our own dance revue—it's paid us enough money this season to make us afraid to try another next year—have six weeks of metropolitan time ahead of us and then a drowsy politan time ahead of us and then a drowsy summer down in our seaside home at Bright-mere-on-the-Deep. Naturally, we're envied,

summer down in our seaside home at Brightmere-on-the-Deep. Naturally, we're envied, in particular by Willie.

Willie is a Norwegian gentleman who does calisthenics on top of a thirty-foot pole held by his brother Oscar. He's been with us over most of the circuit. Really, the boy's been kinda handy now and then, when aerials gets to be the question. Why, one time, back in Portland, Willie hooked one end of my aerial to the courthouse flagpole and the other end to the top of an office building and other end to the top of an office building and Yes, we're radio fans, and proud of it, too.
"What you bane do all summer?" inquires
Willie, genial. "Fish, I bet?"
"You lose," I replies. "The little woman
retails gossip and I helps The Master build

"The Master?" puts in a comedian. "Sounds like an ad for a phonograph."
"The Master ain't no ad for anything except himself," I states. "He's a scientific nut, which same is different from an ordinary nut due to there being a reason for a scientific nut. Get me?"
"Ay know!" exclaims Willie, triumphant.

"He bane that guy who fix my wrist watch

in Los Angeles."

"Clever boy," I grins. "He read half way through Wells' Outline of History before he decided there weren't any snappy stories in

I should bother you with all this; to cover time rapidly, it's now a week later and we're playing a New York theatre. All's fine, and the sky's clear. That is, it's clear until The

Master bursts into our dressing room.

"Joe, I need your help," he says:

"Brayo!" applauds Doris. "You're useful at last!"

at last!"

I ignores the insult. "Well, what is it this time, Jerry?" I asks.

Jerry's full billing is Gerard Lawson, the somewhat belittling term we uses coming from his butlers, of which he has six, other things in proportion. He's young, has a well-groomed appearance, a wrinkled brow and a reverse failing cheek book. Also, he is review. never-failing check book. Also, he is minus a sense of humor. Sometimes this is a God-send; other times, I could tell you—but never

Jerry plumps himself down onto a chair

and leans over.
"Folks," he says, low, "can I trust you?" "You can trust me," says Doris. use your own discretion."

"Well-look here!" He pulls back his coat, disclosing on his vest-a star!

"My Gawd!" yelps Doris. "The boy's a dick!"
"Ssh!" warns Jerry. "Not so loud!"

I grins. "Your secret is safe," I assures him. "Now, tell us just what brought this on

Jerry draws his chair up close to mine and motions for Doris to listen in. Then he speaks.

speaks.
"It's like this: I'm a revenue agent."
I pulls a mock faint. "To think a friend of mine'd play a dirty trick like that on me," I wails. "And just when I'm trying to smuggle in a coupla quarts from Montreal."
"Oh, be your age," snaps Doris. "Maybe Jerry can get you wholesale rates. Speak up, let's have the worst."
"Well, it's this way. I enlisted in the force, not to pursue the ordinary rum runners. but to concentrate my activities upon

but to concentrate my activities upon one certain set of bootleggers who have been successfully evading the law by what seems

"So far so nice," I says. "Go on."
"This particular gang have a ship of their own, perhaps a two hundred footer, with which they slip back and forth from somewheres beyond the twelve mile limit. Now, hear's the popular part it his ship capact or here's the peculiar part: this ship cannot, or at least, has never been traced. It simply vanishes, once it has left land. And it only comes in when circumstances are most propitious; when the night is moonless, or the weather bad, or the dry agents are out of town, or any chain of events makes the landing of a load of liquor easy. Of course, it is obvious that persons on land are communicating with those aboard ship, the question being, how?"

"That's easy," I says. "Radio."
"Oh, no, it's not," contradicts Jerry. "Be(Continued on page 2156)

The Inventions of Reginald A. Fessenden

PART V

OUR brothers can have a lot of fun together. With suitable conventions almost any game can be played, even cricket and baseball. Houses then cricket and baseball. Houses then stood in grounds shielded from public view by hedges and trees, not real estate shrub-bery, but honest to goodness trees, russet apple, snow apple, plum, cherry, perhaps an elm for climbing. All summer long the family took the evening meal out of doors. One might watch the others playing croquet, or later tennis, until, their match finished, he took his place, or one might sprawl on the grass and read. To us children, no matter how small it was, this was a place where one could be private, to which one could invite other youngsters, where one could perhaps build a small hut in a corner or make one' individual garden. Long after, sitting under a tree in the Darwin place in Cambridge, I was reminded suddenly of old times and wondered what children do nowadays with no choice except between indoors and the street or some public playground; and how it was that in our own country the real estate agents have been able to impress their peculiarly barren and ostentatious ideas of landscape gardening on the people who actually own the houses.

Outdoors was also our schoolroom in summer, first my mother, and later our governess Miss Ardagh, being our teacher, but the last year at Fergus I went to the public

school.

DE VEAUX MILITARY SCHOOL

Then we moved to Suspension Bridge, Ontario, and there was a scholarship vacant in DeVeaux Military School, on the other side of the Niagara River, in Suspension Bridge, U. S. Though hardly old enough, nine years, and though unable to go as a boarder as that would cost too much, the opportunity was too good to lose. The walk was rather long and the work started early so I got my own breakfast. In the fall and spring terms the sun would just be coming up as I got to a place called Mount Eagle, and it was a lovely sight and a lovely walk from then on, for the school was in extensive and wooded grounds just at the Whirlpool Rapids. But in winter it was different. Those bitter struggles across the old Suspension Bridge, forcing my way into and across the heavy winds blowing down the Niagara gorge, and holding every now and then with both hands to the railing of the footway. But it was always a good

fight and I enjoyed it. Only once the experience was not so pleasant. My clock had gone wrong and I started off at one in the morning, reached the school about two, could not waken anyone and had to roost in the gymnasium until five. And it was one of those below zero nights.

It was then not so very long after the close of the Civil War, the military discipline was very strict and our inspectors were in the regular service and martinets. So there was nothing slovenly about our drill and the smartness permeated to the classrooms. But we were worked too continuously; there were no intermissions; it was always a rush at the end of a class to fall in on the drill ground or to get to another class. I never played for one minute at that school, coming as I did, and leaving immediately after classes or at noon on Saturdays.

TRINITY COLLEGE SCHOOL, PORT HOPE

The following year, 1877, I went to Trinity College School, Port Hope, Ontario, and remained there until the summer of 1879. My brothers Kenneth, Trenholme and Victor followed later. This school was modeled after the English public schools and most of the masters were public school and university men. Of the boys of about this time perhaps the best known are Dr. Osler, later of Johns Hopkins and of Oxford; and Bishop Brent, whom I remember as an especially fine classical scholar.

Here a good deal more time was given to sports, mainly cricket and rugby football. Some lawn tennis came in later but faded out. Girls had been seen playing it. The lake was near and gave good swimming, bitterly cold in spring. The long strips of flooded marsh land along the shore were splendid for skating and when well warmed

Jessenden

Gescenden

Geschen Sy squarling Joe filments
from allulase Cotton acted on

Gy Cupric ammonium

also Callon disalaced by

Dulphinic Or and

Alto Nitric

"Causlic Patanh

idlso Jum Dentrine

also Indide of Variab profielly

disantingated

The Destine on Carboni song

Jufferip hense it must be delighted

in a Valular in which it will

not closed use and dehydraled by

a dehydrating agent or prikrips

Jhe Constitutional Water Combes

got rida fiby & Almenting

If it can be get porone in this

was it will not puff

A facsimile of Edison's laboratory instructions to Professor Fessenden who, when a young man, was his assistant. The writing is remarkable because Edison writes longhand almost as rapidly as a typewriter can typewrite.

up by this we would often strip and go in the lake, having a time getting back out of the water on to the ice mounds formed by the spray which made the winter shore, and crawling, vermillion hued and in anguish, over the corrugated surface till we reached the smooth surface and raced away for our clothes.

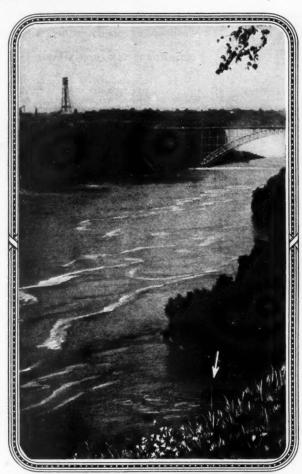
A long hill, starting in front of the school, was for sled and toboggan. In a misguided moment, when the slush had frozen hard, I thought I would go down it a little way, on skates, and then stop. Two years' experience on the gymnasium trapezes got me down to the bottom, erect.

There were long tramps, over the country to the brook for swimming, mainly, though some collected eggs or butterflies. Weekly hare-and-hounds was good for the lungs and

There was little inducement to stay indoors at any time of the year. There were no private studies, and the bedrooms were substantially unheated so that in winter the first thing one did on getting up was to break the ice in one's pitcher with the handle of the hair brush to get the water out. So the only place to read was in one of the "form rooms," furnished with bare oak benches and long oak tables. No doubt things are quite different now, but the old system seems to have had some advantages.



A photograph of the campus of Trinity College School, Port Hope, Ontario, Canada, where Professor Fessenden spent his earlier student years. The school was conducted according to the old English traditional discipline in scholarship and athletics.



The arrow marks the old swimming hole of a group of sturdy youngsters with whom the boy Fessenden spent his school days. The place is between the Niagara Falls and the Whirlpool Rapids and the swimmers had to cope with strong eddy currents.

I cannot remember any boy trying to recite with a sore throat or a cold in the head.

The secular studies were substantially confined to classics and mathematics, taught in the old-fashioned way, which in my experience is exactly the wrong way. Why should it take six years to teach a boy Greek or Latin so that he can read it with difficulty and cannot speak it at all, when a ten-year-old boy learns to speak French fluently in a year? Would it not be better to teach the boys to speak Greek and Latin fairly well the first year, and then apply one or two years more to teaching them the grammatical rules, etc? They would learn so much faster and be so much more interested.

EDISON'S SYSTEM OF WRITING

Our impositions were the writing of so many hundreds of lines, generally from Virgil. We used to hate them, of course, but they had one good effect—they formed the handwriting. In any art or game the best form is always the easiest form. Perhaps the best way to learn a new game is to go out and tire oneself at it till one can hardly move the racquet or club or whatever it is. Then keep on playing, and you may be pretty sure your muscles will unconsciously take the motions which give the best form.

Edison was one of the two men I have met who could write well and plainly almost as fast as a typewriter could typewrite, or a man talking easily. He learned the art as a telegraph operator, taking down high speed messages. Some way or other he has developed a surprisingly rapid and clear system. I give here a few words of laboratory

instructions, such as he used to hand me in the morning when I first went with him, and before I had learned his methods and could carry out his work along the lines he wished without his having to tell me everything. There is no question but that his system should be adopted for all the public schools. It is so clear and he writes it so marvelously fast. Some of the educa-tional authorities should persuade him to permit slow motion pictures to be taken, showing him writing, so the meth-od could be studied.

The other man was Mortaza Khan, the Persian minister in Washington a bo ut 1904. He explained that he always, in his audiences with the Shah, held a tablet and reed pen in his hands and took down every word that was said to him. But Persian is a much easier language to write than English.

HOLIDAYS ON NIAGARA RIVER

Holidays at Suspension Bridge were times for scrambling about the cliffs of the gorge between the Falls and the Whirlpool, or at the Whirlpool. There

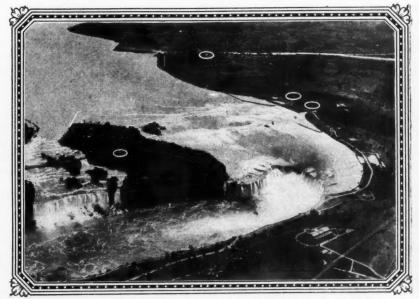
was an old mill race, abandoned, just above the Whirlpool Rapids, where we went in swimming; perfectly safe, but a very swift current, so we were all strong swimmers. The edge of the Whirlpool was not so safe and several of the boys were drowned; one, Preston, son of our next door neighbor. So we left that and went up river, to-wards the Falls. There, too, we could fish for eels, and a cave where real smugglers and criminals hid when trying to get across the border. No one got drowned here, but there were every now and then strong eddies which had twisted their way along from above, and which would suck one down. Some of the older boys had learned a trick which they showed us. If, when an eddy caught you, you kept swimming a breast stroke, it would suck you down. But if you turned over on your back and floated, it would whirl you round a few times and then throw you out at its edge. Some, occasionally used to go still further up the river and swim all the way across, starting a little above the new Suspension Bridge on the U. S. side and landing about half way between the Falls and the Whirlpool Rapids on the Canadian side.

CAPTAIN WEBB'S DEATH

A number of people went through the Whirlpool Rapids in barrels, but I think no one swam it. Captain Webb tried it. Crowds watched him from the bridge and the cliffs. He had men row him into the middle of the river to make sure that he got into the central current. The boat barely got back. It was terrible to see him sucked faster and faster toward the rapids. Once in the rapids the great jets of spray hid him most of the time. Then he was seen on top of a great surge opposite a jutting out ledge of rocks, but not again.

CHIPPEWA

Then we moved to Chippewa where there was a delightful old rectory with a splendid garden, all kinds of fruits and vegetables and a good horse which we uesd to ride all over the neighborhood bare back. There were ever so many rooms in it and during the many years we lived there my father and mother kept a rather delightful fashion of open house. People would drop in and stay for days or even weeks. One couple drove up to spend the night and remained for more than a year. The expense was practically nothing. The rooms were there. The cow gave plenty of milk and enough over for butter. We raised our own corn for the cow. There were no servants. When din-



Much of Professor Fessenden's time in his boyhood days was spent on the Niagara River. The circle in the background marks his father's rectory at Chippewa, Ontario, while the circles in front mark the islands over which Professor Fessenden used to roam during holidays.



Professor Fessenden's graduating class at Bishops College, Lenoxville, Quebec. Here Professor Fessenden while still quite young taught mathematics, Greek and French to classes some of whose members were older than himself. Professor Fessenden is the second from the right in the row at the back, standing.

ner time came my mother would say to one of the visitors, "Katie, you pick this bowl full of strawberries. You will find them down at the right-hand end of the garden. And Mrs. Gordon, the peas and the asparagus are just right now. Professor, I am going to make a big omelette, and we will need about a dozen eggs. The hens lay mostly in the stalls." And so, everybody helping, the dinner would assemble itself. The only expense was the meat, and good steak could be bought for ten cents a pound.

There were always people in the house, and I cannot remember an unpleasant visit. For one thing, unpleasant people would not have wished to come, or if they had, would not have been asked. And many of the visitors were very interesting. Martin Tupper, Dean Stanley, the Duff-Gordons, are some I remember. I am glad in one way, but sorry in another, that I could not think much of Tupper's poetry. He asked me, then about eleven, which poem of his I liked best. After some silent consideration I picked out the one which seemed to me least objectionable. It happened to be one of which he was especially proud so he presented me with a set of his works. It is not generally known that when at Oxford he beat Gladstone in Divinity.

The Rectory was about a quarter of a mile from the Niagara River, about two miles above the Falls and little current, so the swimming was pleasant and safe. Every morning during the summer months a procession started from the glebe, one boy on the horse, one leading the cow, three very tame ducks, the other two boys, my father, and the men visiting us. The ducks had a game of their own. After they had finished their breakfast from what they got in the shallows, they swam up to us and bit us in play, often to hurt, and were very dignant when held head under too long. Then we dressed and came back, but the ducks did not come waddling back till noon. It was further up the river, above the Chippewa, that I had to bring in a boy who had been carried out by a rather fast current which came from behind a point. It was not so interesting as anticipated. He did not so interesting as anticipated. He did what he was told and was prosaically towed to safety in ample_time and without any risk on my part. But another time, years after, in Pamlico Sound, it happened to be a very excitable individual who was being carried out and who kept wasting his breath in shouting for help. So that time I picked up a big piece of wood which was on the shore and pushed it ahead of me and kept

him at the other end of it. This method is recommended as being not only safe, but comfortable, as one does not have to hurry so getting back.

DRUMMONDVILLE HIGH SCHOOL AND THE IMPERIAL BANK

Then, after an illness and an operation on my eyes, I was supposed to attend the high school at Drummondville. But except in winter I played hookey entirely, in the Clark Hill and other islands about the Falls, and in the woods. With a couple of good stories, Marryat or Cooper or Melville White, to read, a little fire a few inches square, of twigs, to cook my lunch, I would lie along the grass next the edge of the running water. Or I would tramp around or fish.

Then as they would not admit to college until 16, came a year in the Imperial Bank at Woodstock, where owing to illness of officials, rapid extension of the bank in a growing town, and mainly the kindness of the president, I filled some months in every position in the bank except cashier. It looked as if I would remain with the bank, but I learned just in time that there was a fixed policy as to age at promotion to the positions which really counted. Then came a couple of terms' work at Trinity School to prepare for the honor examinations and the examinations themselves where I came out only second or third.

BISHOPS COLLEGE SCHOOL AND BISHOPS COLLEGE

During the summer holidays after the examinations came an offer from Bishops College and Bishops College School, of a mathematical mastership in the school with the privilege of being credited with the year's college work without attendance, provided I passed the college examinations in the subjects. This was too good a chance to lose, especially as my father had to look after the education of my brothers.

The college is at Lennoxville, Province of Quebec, on the river St. Francis, and was where my father took his divinity degree. School and college buildings were around the one quadrangle or near it. The school was very much like Trinity College School, but not so large or with quite such a tradition. Though I was called senior mathematical master in the school catalog, the work was quite easy. Later on I even added one of the junior classes in Greek and one in elementary French. But, at that I never had more than two or at most three hours per day. Of course, the other masters were much harder worked; possibly it was felt not wise to put much responsibility on a master who was younger than some of his pupils.

But the college was a delight. And it was there that I made my first invention.

Lessons in Esperanto

(Prepared especially for Radio News by James Denson Sayers, Esperanto writer and Editor, President of New York Esperanto Harmonio Club.)

LESSON 7 USING THE ESPERANTO AFFIXES

I HAVE received a large number of requests since these lessons began in Rabio News, asking that information be given here about addresses of Esperanto publications, book publishers, how to place ads for correspondents in other countries, etc. It is obvious that I can't turn this into an advertisement column, but as it is of great importance to the students of these lessons that they have this information, I will gladly furnish

such to all who send me a self-addressed envelope to Box 223, City Hall Station, New York City.

It is not necessary to extensively illustrate the manner of using all the Esperanto affixes, but for some of them it is.

-Ac, a suffix. An indication of con-

-Aĉ-, a suffix. An indication of contempt. Indicates that the thing, animal or person to which it is attached is in some way of poor, or slovenly character. Viro, man; viraĉo, a bum, a slothful, idling fellow. La viraĉo rajdis ĉevalaĉon kaj portis sur lia kapo ĉapelaĉon. The bum rode an old stack-of-bones nag and wore a shabby hat on his head.

-Ad-. This suffix indicates that an action is being continued or is habitual. It marks an action that is of some duration, not just for a moment. Thus: La ridado

estis laŭta kaj senĉesa dum la vespero. The laughing was loud and unceasing during the evening. Dancado, dancing; desegnado, designing; kantado, singing; skulptado (the art of) sculpture; skribado, writing. These words do not signify momentary acts, but habitual actions; in fact, they are arts or practices, as the art of painting, singing, etc. Kanto, a song. Ŝia kanto plaĉas al mi, Her song pleases me. Ŝia kantado carmas min, Her singing charms me. Movi, to move; movado, a movement; La Esperanto movado.

-Aĵ- denotes that the idea contained in the root word it is used with has a certain quality, or is something made up of

(Continued on page 2146)

Latest Radio Developments

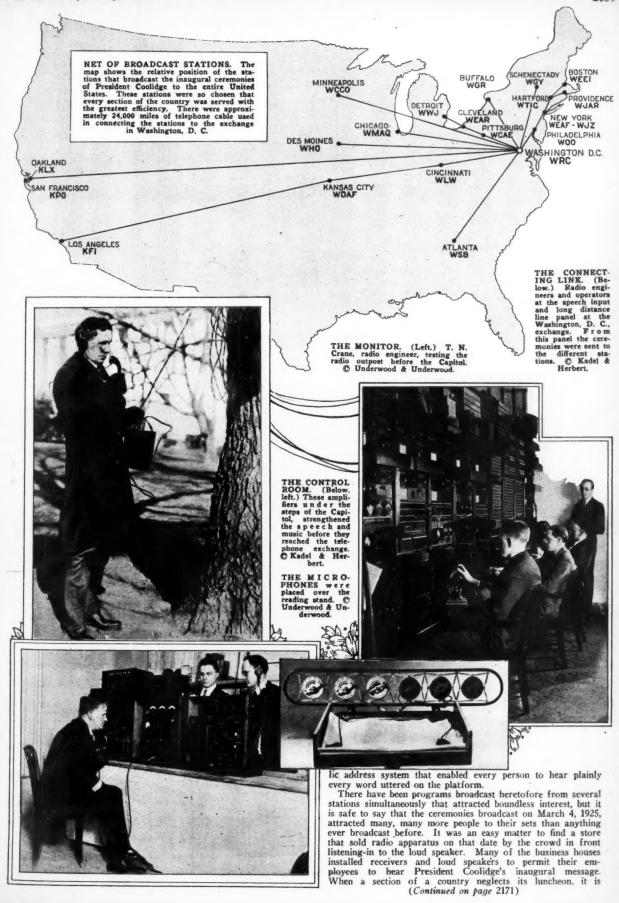


LOUDSPEAKER EARPHONE CHURCH IN GER-MANY: Above. For persons who are ordinarily too deaf to bear church services, a microphone in the chancel and another in the pulpit pick up the minister's voice, which is then amplified and connected to earphones in the paws. © P. & A. Photos.

The Radio Inauguration



E ole at yk,



The Month's **Advances** in Radio

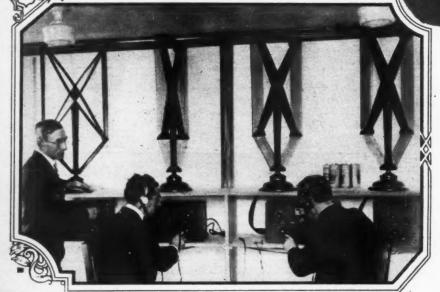
WAITING CHAUFFEURS ENTERTAINED BY RADIO.
During rush hours, a New York store provides a garage for patrons' cars and entertainment for chauffeurs. © Underwood & Underwood.





MUSIC FROM WALL SOCKET. In one of New York's newest apartment houses all that is necessary to have loud speaker reception is to plug in on one of the four outlets in the wall. (By United)





Above. RECKIVER IN FORM OF A HOUSE. Each room contains a miniature radio set in this unique "Radio House," and by opening any of the windows signals from 15 stations may be heard. © Underwood & Underwood.

Left. APARTMENT HOUSE CENTRAL STATION. Four re-ceivers on the top floor of the build-ing mentioned above supply tenants with four different types of enter-tainment. (By United)





KING ALFONSO
BROADCASTS.
Right. His Majesty,
King Alfonso, of
Spain, made his debut
before the microphone
recently at a Spanish
broadcast station. The
microphone is covered
with a cone-like arrangement which condenses the voice or
tones before putting
the m on the air.
C International Newsreel.

GERMAN RADIO
CLOCK. Left. The
clock not only has the
usual works that
make the hands move
but also a radio set
that causes the loud
speaker to operate.
This invention was
recently announced
in Germany.



PROVE THEIR
BROADCAST
MUSIC. Right. An
unusual, but effective
method of improving
their music is employed by this orchestra
who listen in to their
own selections as they
are played. © Kadel
& Herbert.



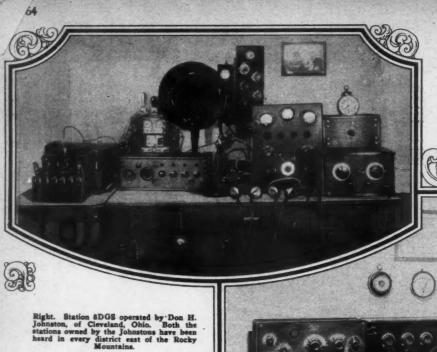
DEVICE FOR RECORDING RADIO SIGNALS. Left. In the research laboratory of New York University. Messrs. Borden and broadcast concerts on phonograph records with the aid of their device. A special type amplifier is shown carrying the music to the loud speaker unit on the phonograph. © Kadel & Herbert

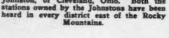
Do

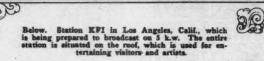
(6)













KFI SUPER-POWER STATION OF THE WEST

THE installation of the new 5,000-watt transmission set on the roof of the Packard Motor Car Building gives to California the first of the super-stations. This is the first station of its type to go on the air, and with the present KGO in Oakland, gives the State the two most powerful broadcast stations in the country.

The new station is licensed under the present law to operate at 1,000 watts. In addition to this, the new station has a special license permitting it to go on the air at 1,500 watts. From this point up to the full 5,000, the amount of power to be used will depend on the local existing conditions, as it is not the desire of KFI to unduly interfere with any future or at present existing broadcast station.

of KFI to unduly interfere with any results ing broadcast station.

To compensate for the increased power of the new transmission set, the towers have been raised an additional 75 feet, giving a total height of 225 feet above the street level, making them the highest structures in Los Angeles. The roof is ready for the installation of the mechanical equipment, for which (Continued on page 2130)



The Month In Radio.

Being a digest of the odd, interesting, more human side of America's greatest indoor sport. A treatise on the fads and foibles and general effect of Radio on civilization.

Conducted by W. B. A.

RADIO SHOP CLERKS EDUCATED

A School for Radio Clerks! This is the. latest in educating the public to the great advantages and advancement of radio. of the big Eastern radio corporations has decided that its salesmen behind the counter must know a little more about the apparatus they have for sale than the price of it. There is to be much intensive training dealing with the underlying principles of the art, as well as an educational campaign of selling talk for the apparatus of the particular brand. for the apparatus of the particular brand. Therefore, the next time you go into a radio store and ask for a left-handed rheostat, the clerk probably will not have to hold lengthy consultation with the manager in order to learn that all rheostats are left—or right—handed. The millenium draweth nigh.

The second batch of Metropolitan Opera stars made their radio debut and the the-atrical and musical interests are still a long way from the bankruptcy court-an astonishing condition, according to some of the savants in that field. As a matter of fact, quite the contrary. From all reports, the stars who did the singing, Toti Dal Monti and Guiseppe de Luca, are quite satisfied with their efforts, at least after receiving the monthly royalty check from the phonograph record which sponsored their appearance before the microphone.

Again the amateurs come to the Again the amateurs come to the fore—
and, as usual, in an entirely new field. John
L. Reinartz, probably the world's most
famous radio amateur, was heard by F. A.
Meyer, of Wickford, England, in broad open
daylight. (It was daylight at both stations
and the waves traveled in the sun all the
way across the Atlantic.) The surprising way across the Atlantic.) The surprising

thing about the report is that the transmission was carried on a wave-length of 21 meters. Reinartz's signals were quite QSA, as the hams' parlance goes, which is to say they were heard very clearly.

May the good Lord help the listeners in the Big Village, known in the headlines as Gotham, Manhattan, or Little Old N. Y. A few Sundays ago, the evening found another 500 watts splitting the already crowded ether around the Woolworth building and Brooklyn bridge. Station WMCA came on with a smash—but that is only the beginning. After the grand opening, with the usual garnishment of celebrities and program d'oeuvres, it disappeared, seemingly, as quickly as it appeared. But as soon as it passed out, another station began in its place with the call 2XH, giving programs and announcing voluminously that they were testing! WMCA is now on 285 meters. The new station was dividing time with WSB in Atlanta, Ga., and it is rumored that the whole situation will result in another job for Secretary Hoover.

SOMETHING NEW IN STATION DESIGN

Radio fans soon will be listening in to new broadcast station to be established in Buffalo. Its antenna will be 400 feet above the street level, for it will be swung from masts rising from the tallest skyscraper in Northern New York State, the building of the Liberty Bank, recently completed.

The original intention of the officers of the bank was to have on each of the towers a statue of Liberty bearing a torch, but in compliance with the popular demand, they requested the architect to make plans for a broadcast station instead.

The bank's new home is, as far as is known to the architect, the first skyscraper especially designed to carry a broadcast station. The steel masts of the station are so riveted and bolted to the framework of the building, several floors below the summits of the towers they will withstand the velocity of the highest winds which sweep from Lake Erie and the North. The latticed masts which resemble those of a battleship, and are unique in design, will be illuminated at night from flood lights on the roof.

The towers of the Liberty suggest the Ur-American period, for their outline was studied from that of a pyramid in Guatemala many thousands of years old, on which was a temple from which the ancient priests, archaeologosists say, trumpeted messages to faithful worshippers. The new station will send its call, however, through the ether to unseen audiences hundreds and thousands of miles distant.

This bank is 24 stories in height, exclusive the towers, and the masts rise 60 feet above their pyramidal pedestals. The studio is to be in one of the towers and operators will work in a pent house on the roof.

And talking about Secretary Hoover: Recently, columns of newspaper copy were turned out on the fight in Cincinnati. It was like this: The directors of WLW Radio is creating its own architecture.

Above is the plan of a new Buffalo station.

read the Constitution of the United States one night before going to bed and became filled with an idea of their own greatness They learned that they had a perfect right to broadcast when they pleased.

Now there is another station in Cincinnati, the directors of which also know the Constitution and by the same token were advised of their right to do the same. The result was inevitable. Worse than that, result was inevitable. in fact, since both stations were practically on the same wave. For about two nights the listeners were treated to a rare dish-hash! Both stations transmitted constantly and with the best artists available.

Enter Secretary Hoover. A representative of his department was presented with a ticket to Cincinnati and told to fix things A few words and the two stations began to laugh at the situation they had instituted. After a good dinner and many words—friendly—the department agent succeeded in working out an amicable arrangement whereby the stations should divide time on the air-and did.

Those who like the choral work of the Zion City choir as transmitted through the Voliva station at the city of the same name, will be delighted that the power input is to be, not 500, but 5,000 watts in the very near All arrangements have been pleted and the super power will be available to the antenna.

Which calls to mind the recent super power broadcast vote which was held re-cently by RADIO NEWS. Before the year is over this question is going to be one of the greatest importance and will probably affect the whole future trend of broadcast-"The Month" asks for comment. (Continued on page 2173)

40 Non-Technical Radio Articles

every month for the beginner, the layman and those who like radio from the non-technical side.

SCIENCE & INVENTION, which can be bought at any newsstand, contains the largest and most interesting section of radio articles of any non-radio magazine existence.

Plenty of "How To Make It" radio articles and plenty of simplified hook-ups for the layman and experimenter. The radio section of SCIENCE & INVENTION is so good that many RADIO NEWS readers buy it solely for this feature.

List of Radio Articles Appearing in the May Issue of "Science and Invention"

Loud Speaker in Every Room.
College Radio.
Single Control Receivers, Part 2.
By Leon L. Adelman.

By Leon L. Adenima.

A Giant Radio Mast.
A Portable Vacation Receiver
By Lynn Matthias.
Does Your Set Radiate?
The Radio Cheater.
A Page For The Novice—Part 4.
By M. Joffe.



he Dife and Work of Lee DeFores





DeForest at his early radiophone. Note the talking machine.

PART VIII

ND you actually carried on in-telligible communication between the moving train and your fixed stations in St. Louis and South Chicago?" asked the reporter for the Asso-ciated Press, as he was interviewing Dr. Lee DeForest in his room at a hotel in the

"Yes," said DeForest. "There is the operator's log." And he tossed a closely packed envelope on the table by which the journalisations.

tic worthy was sitting.

As reporters always do, he opened the package and looked seriously at all the pages.
They were Western Union telegraph blanks, bits of Chicago & Alton Railroad stationery and all sorts of waste paper, including used envelopes and the backs of letters. Not a very imposing bunch of original records, but the tale of the first compunication by but the tale of the first communication by radio between a fixed station and a moving train was written on them.

On DeForest's return from the installation of the stations he had been erecting in the Tropics for the Navy, he learned that the Chicago & Alton Railroad was interested in the work he had done with wireless and had asked many questions about it. Immediately he started for the office of the road's president at Chicago. There he succeeded president at Chicago. in making the necessary arrangements for a test to be carried out on the fast mail trains that ran between St. Louis and the Illinois metropolis.

THE STATIONS

So, shortly the arrangements were completed. There already were stations handling traffic from St. Louis and Chicago, so the only other installation which remained to be made was the one on the train.

The standard company apparatus was used in constructing the set. It consisted of a rec-tifying detector, a two-slide tuner with headphones and a local battery. was a lamp cord strung along the length of the train from the observation car where the set was located, forward to the first mail The instruments were grounded to the

wheels of the car where the set was located. The train left St. Louis at 11:10 a.m. on the first day of the test. It was more than useless to attempt reception of the signals while the train was in the station shed or making its way through the downtown section. There was so much steel and so many towering structures that the signals were effectively shielded; especially was this the case with the small power being used at the transmitter and the nature of the receiving apparatus antenna employed.

However, as soon as the train cleared the tunnel, just before it reached the river bank of the Mississippi, the dots and dashes began to come in. At first they were faint, then constantly grew louder, reaching a maximum when the train was moving up the west side of the river. Then reception remained good until it started into the Merchant's bridge which lies about three miles above the station some four miles from the transmitter.

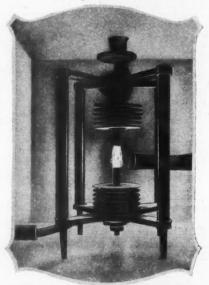
As soon as the train cleared the span and started up parallel with the river on the opposite side, the signals again came in with great clarity and remained easily readable until the course took another slant diagonally from the river. Here the signals again became faint and almost inaudible. The operators thought the test completed, not expecting to hear the home station again on

At Granite City, some 25 miles from St. Louis, the signals again became audible. And the notable point was that the

track had again come back parallel and near the river. They remained in communication for several miles more.

Two factors made themselves apparent to DeForest when he examined the reports of the operators in charge of the train installa-tion. First, that the Mississippi was acting as a wave chute and carrying along the impulses on its bosom. Second, that the steel bridge structure, which was of course grounded, acted as an especially effective shield, stopping any reception of the waves through it. He also found that the receptions tion was in proportion to the bonding of the rails, so proving again that an effective ground was absolutely essential for the best

The same experiments were carried out



Shades of old time interference? The old DeForest spark gap at the Manhattan Beach station.

in

ne

ta m

an of

in

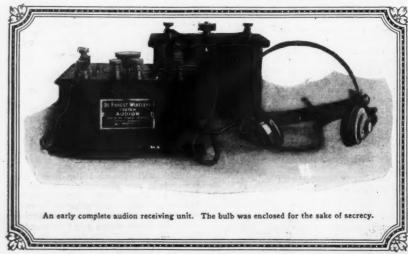
from the Chicago station with practically the same results. The signals disappeared the same results. The signals disappeared both ways where the rails were insulated for the block system which the railroad employed. This condition reduced the available ground to the two lengths of rail upon which the results and the results are the res which the wheels of the car happened to be resting. And observations tell that usually the railroad is laid in gravel and ballasted with rock. Not an exceptional ground connection.

ONLY TWO ELECTRODE VALVES

It might be well to note here a little incident in connection with the two electrode It was about this time that the De-Forest Company sold the first and only two dual electrode tubes for wireless reception dual electrode tubes for wireless reception in this country. They were installed in the Brooklyn Navy Yard at that station and gave excellent results. However, the three electrode audion was well on its wy to perfection and so no other of the wo electrode type was either made or installed.

In the early part of the year, the company decided that it would be a good point for the advancement of the art in general if they could establish and check the transmission of a few trans-Atlantic messages. As soon

of a few trans-Atlantic messages. As soon as the decision was made, DeForest was immediately plunged into the work of making



the necessary arrangements. The famous old station DF at Manhattan Beach was working regularly, and it was given the task of caring for the American end of the work. DeForest began planning for the station in Europe which was to be placed on the west coast of Ireland. Since the affair was to be only a test, it was decided that the erection of a permanent installation would be more costly than the benefit received would warrant. Consequently, DeForest set about to find another method of transmitting and receiving the test than through the usual system of triangular towers and antenna.

It happened that about this time Dr. Alexander Graham Bell was performing some work in aeronautics. He had devised a sort of tetrahedral kite which had exceptional strength and lifting power. It resembled more than anything else a great piece of honeycomb, the cells of which were three instead of six-sided. DeForest came to a working agreement with Dr. Bell and the kites were made. So DeForest shipped for Ireland with his kites and the necessary receiving apparatus.

It was in February that he and his assistants arrived and began the actual work of erecting the station. The antenna was built with flexible wire.

The custom was for the men to go out in the afternoon and fly the kites, then return to the hotel and take a few hours' rest before the time appointed for communication. The difference in time between the two stations forced them to carry out this part of their work well after midnight. And many times they would arise in the cold gray night, go over to the station only to find that since the afternoon the wind had died down and the antenna, instead of riding high, was stretched out over the various hedges, fences and barns of the countryside. This happened night after night, but they kept after their goal and finally received the first message across the great expanse of the Atlantic ocean, April 11, 1906.

And with it, they removed themselves back to the United States. They gathered up their apparatus, the kites and their hangars—they were so big that they had to be put in hangars—took their notes and returned to other fields of endeavor.

LOW ANTENNA

Upon his return to New York, he found some improvements necessary at the Connecticut station of the company. Without taking so much as a day's rest, he went immediately to the station and made the necessary repairs. And while there, doing some testing, he had occasion to use a long, low antenna. He strung a long antenna on top of some miscellaneous poles which he found in the equipment of the station and attempted reception. The results were astounding. This was not enough. He took the antenna off the posts and using insulated wire, laid it on top of the earth, so that he could more

nearly place it in the proper direction. The results almost sent DeForest to write a paper for one of the scientific societies. They were, to say the least, astonishing.

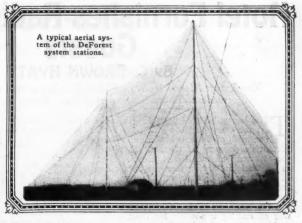
Always before, the main point in the antenna, according to the tenets of the art at that time, had been its he ight above the ground. And here he had discovered that it was not even necessary to elevate the antenna at all. In fact, at the completion of the insulated wire experiment, in order to

check his results and at the same time to make any further discoveries as to the actual nature of the waves, he substituted a bare wire for the insulated one and found the same results so long as the wire was laid

on dry, sandy soil. Before he had completed these investiga-tions, he was called to the Toronto station in Canada. This installation was working in conjunction with another at Hamilton, handling a great deal of traffic and making quite a name for the company and its stations. Some improvements were needed and De-Forest was on his way there to see what changes, if any, were needed. The stations, he found, were seemingly fighting a dead spot or some interference, as it was called then, between them. He set out to make some tests in the field. Of course, there was no provision made for his erecting antenna, so he fell back upon the low antenna method he had just discovered. It could not be placed upon the ground, however, on account of the condition of the weather. he placed his wire on the bottom cross-arm telephone poles. For a ground he used the rails of the railroad (he was making the tests along the right of way of the main line between the two towns, the most direct route, and, therefore, the one presumably traveled by the wireless waves) or in some cases to the limb of a skinned bush or small tree, when the track did not work so well.

And here is where he made a second discovery—or at least had it under his nose. He found that the wires of the telephone and telegraph, on the poles above his antenna, served as a "wave chute" allowing the most extraordinary reception of the signals. He checked the effect by removing the antenna away from them and still keeping its directional property. No matter how carefully the other antenna was pointed toward the

transmitting station, the results could not compare with those when it was placed



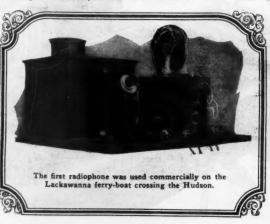
under the telephone wires for strength of signals.

Wired radio? Possibly this is the first case of it in the history of the art. Though the primary laws of its use were not promulgated as a result of the experiments, it can hardly be denied that the principle was involved. The comparative test showed it plainly and there is no other means which can be used. And as corroborative testimony, there is the entry in DeForest's note book to the effect that the telephone and telegraph wires acted as a "wave chute." (U. S. Pat. 1,101,533.)

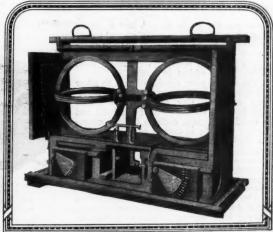
But it might be noted here that DeForest took out a patent on both the low antenna, the antenna lying on the surface of the ground and the antenna strung along the telephone poles. The claims cover the directional effects, too.

Then in the early summer, shortly after his return to the home office in New York, came the second great disappointment in his The company had, under the financial direction of Mr. Abraham White, its president, gotten itself into serious financial difficulties. He had, in order to make a bit more out of it, fallen into the ways of promotion schemes, it is said. DeForest, when he first learned of it, immediately made plans for withdrawal. Reports were published in the papers of the time that White had obtained control of both the Marconi Company stock in this country and that of the De-Forest Company and intended to amalgamate them into one huge corporation. He had not, evidently, gained as much control of the Marconi interests as he thought, for the morning following this statement the same

(Continued on page 2182)



At the right is one of the first radio wavemeters ever constructed built for De Forest.



Hotel Furnishes Radio for Its Guests

By C. BROWN HYATT

The Robert Morris Hotel in Philadelphia has started something-it has made radio available to its guests. Others must follow.

HE impossibility of furnishing a radio set for every guest of a hotel, or even one-tenth of them, is obvious under the present development of the art. However, the managers of the Robert Morris Hotel in Philadelphia, having seen the advantages of providing their guests with the wealth of free entertainment which is afloat in the air most of the time, set about, while draw-ing the plans for their hostelry, to find a way of making it possible for their guests have radio at hand while staying in the

Guests staying in the hotel have only to call the telephone operator in order to enjoy the best on the air.

The logical course, they thought, was to call upon one of the large corporations dealing in radio. This they did only to find that there was no plan worked out for such an installation and that it would require the services of several high-priced engineers and a great amount of time to work out the de-tails. The prospect looked so dark that they were almost decided to let the project drop when a young local engineer volunteered his services.

teered his services.

The result of his work on the scheme is shown in the accompanying photographs and the simple methods he employed in the installation are fully described below.

It was decided that a multiplicity of stations was not to be desired, that it would be exactly the recognization and study.

be much more simple of operation and sturdy in practice if the installation were to oper-ate on two or three stations. It was then only a matter of selecting the stations from which it was wished to receive.

The second point considered was to allow the second point considered was to allow the telephone operator to operate the neces-sary controls. One central radio station was installed on the roof of the hotel and a system of remote controls devised whereby she could be in control of the set. set itself was arranged to operate on two wave-lengths—four stations available on them—and the control at the switchboard arranged so simply that even a child could operate it. Fig. 2 shows the control for the operator.

Through this system, loud speaker or head-phone service is available in every room of the hotel during all the time the sta-tions are on the air. It is only necessary for the guest to pick up a pair of phones installed permanently in every room.

THE APPARATUS

In order to obtain an efficient station, it was necessary to locate the set on the four-teenth floor and place the controls on the first floor, operated by the telephone operator

at her switchboard.

In this manner, by a system of relays, it was possible to construct an apparatus which would not require an experienced operator

would not require an experienced operator to tune or maintain.

The difficulty of tuning different wavelengths was solved by using (in this case two wave-lengths gave four different stations) two single pole double-throw relays, represented by 16 and 17, Fig. 1. These relays are actuated through switch 19, Fig. 1, and an opening and closing switch 2, Fig. 2. and an opening and closing switch 2, Fig. 2, located at the telephone switchboard.

The contacts of the relays are connected to the tuning circuits 8, 10, 21 and 23, Fig. 1. Different wave-lengths are thus obtained from the telephone switchboard.

Switch 18, Fig. 1, changes the tuning circuit from the auto-matic controls to an external manual operated set to be used when special reception is required.

In order to obtain selective tuning, the lateral wound inductance coils were constructed to oscillate at their respective fre-quencies. Thus only a minor adjustment is required which is ac-

complished by small capacity condensers 11 and 12, Fig. 1.

The primary and secondary coils of the oscillators are coupled very loosely, due to their oscillation period. In this manner very clear reception can be obtained. With the addition of more sets of relays and oscillators, it is possible to receive any number of



Fig. 1. The receiving set for the hotel installation is panel mounted so that the whole unit is self contained, even to the battery and the plate supply. It also makes for more convenient repairs and allows absolute ease for making the wave-length adjustments for the stations to be received.

Two amplifier panels are used: One for the loud speakers and one for the head-sets in the rooms by connecting the primaries of both first audio transformers in parallel and then the circuits are amplified sepa-

BATTERY CIRCUITS

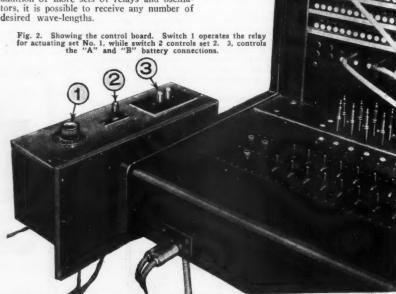
A compound relay 1, Fig. 1, incorporates A compound relay 1, Fig. 1, incorporates the features of turning on and off the set and charging the "A" and "B" batteries in such a manner that they are fully charged at all times. This relay is actuated by switch 3, Fig. 2, of the remote control panel operated at the telephone switchboard by pressing the white button which energizes the closing solenoid, thus closing the relay.

When this relay closes, the "A" battery circuit to the filaments is closed, and the "A" battery charging circuit is turned on.

"A" battery charging circuit is turned on.

The "A" battery is now charged at the same rate as its discharge plus a 3 per cent overcharge to compensate for the battery (Continued

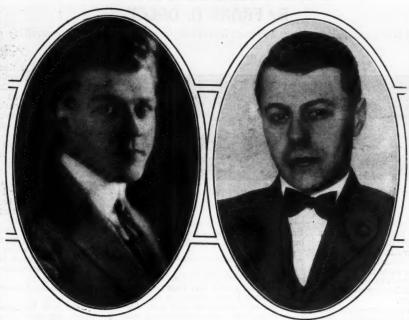
page 2114)



ANNOUNCEMENT

R. ROBERT E. LACAULT, who for the past years has been Associate Editor of RADIO NEWS, has resigned from the editorial staff for other endeavors. Mr. La-cault has been for some time engaged in radio research work, and recently decided to devote all his energies to it. Mr. Lacault has contributed not a little towards the editorial success of RADIO News, and it is with regret that we see Mr. Lacault leave.

The duties of the Associate Editor have been taken over by Mr. Sylvan Harris, B.S. in E.E., A.M. I.R.E., A.I.E.E. Mr. Harris, an accomplished radio engineer, needs no introduction to readers of RADIO News. He has con-tributed a number of



ROBERT E. LACAULT

SYLVAN HARRIS

excellent papers to this magazine, as well as to other magazines throughout the coun-He was formerly technical editor of Radiofax of Philadel-Mr. Harris is phia. a graduate of the University of Pennsylvania. He is an expert on modern radio, having done a great deal of valuable re-search work in his former positions.

His recent scientific papers on "Analysis of Condenser Resistance," several of which have appeared in RA-DIO NEWS, have been widely commented upon in radio circles.

Mr. Harris is also the co-author of a new method to determine condenser losses.

Several new radio circuits developed by Mr. Harris will be published shortly RADIO NEWS.

Home-made Set Contest \$500

N order to encourage experimenting and the construction of home-made sets, Radio News is offering prizes amounting to FIVE HUN-DRED DOLLARS for the best home-made sets submitted according to the rules below. There DRED are, of course, hundreds of experimenters all over the country who are working day and night on the construction of sets, but there are doubtless as many more who would do some valuable experimenting if offered any encouragement.

Therefore, in order to strengthen the desire for knowledge and experimenting for both the old-timer and the beginner, RADIO NEWS has offered the announced cash prizes.

In order to judge fairly, the judges will consider the merits of each set in the following manner and rating.

NOVELTY. 10 per cent.

DESIGN. 20 per cent.

WORKMANSHIP. 20 per cent.

RESULTS AND EFFICIENCY. 50 per cent. The definition's of these terms follow:

NOVELTY. Special design of parts, or novel features, switches, jacks, etc., that will add to the general efficiency of the set.

DESIGN. Style of circuit used, general layout of apparatus on panel and baseboard and simplicity of construction.

WORKMANSHIP. This will include the general appearance of the set, the neatness and electrical efficiency of the wiring, and the smoothness of operation of moving parts, as rotors, con-

RESULTS AND EFFICIENCY. This will include the general operating efficiency of the set.

The sets will be tested in the Laboratories of The sets will be tested in the Laboratories or Radio News either on a loop or outside antenna, as the builder may specify. The judges with be the staff of Radio News and the staff of Radio News Laboratories; the chairman will be Mr. Hugo Gernsback, the editor of Radio News. Each judge will vote upon the relative merits of each set on the basis outlined above and the-sets that receive the highest percentage in each class that receive the highest percentage in each class will be awarded the prizes. These decisions will

Any sort of a set may be entered in the Con-test—from a crystal set to a Super-Heterodyne— and each set will have an equal chance. The

question of range will be taken into consideration and performance of each set will be considered, not on freak range, but on consistent results and quality of signals received. Standard tubes will be used in testing the sets in the Laboratories, unless the builder specifies otherwise. Also, two different makes of standard loud speakers will be used on every set to test the quality of reproduction.

All sets will be judged in their own class depending upon whether they use crystals, one tube, two tubes, etc.

In the manuscript accompanying each set tere should be specified what plate voltage should be used and any other useful information that will enable the judges to see the receiver working under its best conditions.

Prizes for the \$500 Home-made Set Contest

First Prize						۰	٠		۰	٠	.\$200.00
Second Prize											. 100.00
Third Prize											. 75.00
Fourth Prize .											. 50.00
Fifth Prize											. 35.00
Sixth Prize											. 25.00
Seventh Prize		0		9	ø					٠	. 15.00

RULES OF THE CONTEST

- 1. A manuscript of not over 1,000 words, describing the set, must accompany every set entered in the Contest.
- Contestants may enter more than one set in the Contest.
- 3. All manuscripts should be typewritten or clearly written in ink and all diagrams should be clear enough to show all details. No penciled matter is allowed. The type of circuit should be mentioned in the manuscript and a complete description with sketches of any special home-made parts or unusual features embodied in the set. All manuscripts must be mailed flat. No rolled manuscripts permitted.

- 4. All prizes will be paid upon publication.
- 5. Should two contestants submit identical sets. thus tying a prize, the same prize will be awarded
- 6. Excluded from the Contest are radio manufacturers and the publisher's employees and members of their families.
- 7. Each set should be accompanied by a photograph of its builder, and should be of at least postcard size.
- 8. Sets should be very carefully packed and tubes, batteries or similar accessories should NOT be sent.

IMPORTANT GENERAL INFORMATION

Before sending in your set, be sure that the binding posts are correctly marked or labeled.

Put your name and address on a tag and tie the tag with a string to a binding post or other projection on the outfit.

Packing is most important. Too many times sets have come to us smashed up. For that reason, all sets must be shipped to us packed in wooden boxes. First wrap up the set in a good grade of packing paper, then place excelsior all around the set. Make sure that no excelsior gets into the instruments. This alone will not help, though, if heavy instruments, such as audio frequency transformers, sets, are not served. frequency transformers, etc., are not screwed down with strong, stout screws to the baseboard. If a transformer is ripped off in transit, it is liable to smash other instruments, making it impossible for us to test the set.

Sets which have little chance of winning prizes are the following:

Sets crudely assembled, using poor instruments, wooden panels instead of bakelite or radion panels, slipshod work, loose coils, etc.

10. Any non-prize-winning manuscripts published will be paid for at the regular space rates. Rejected manuscripts will be returned after the close of the contest.

11. This Contest closes in New York on May 20, 1925, by which time all entries must be in New York.

Address all communications and boxes to Editor, Home-Made Set Contest, c/o Radio News, 53 Park Place, New York City.

Q

The Monophase Circuit

By FRANK H. DALET

RADIO NEWS is happy to present a new set incorporating a novel method of controlling oscillation in radio frequency amplifiers.





Showing the front panel view of the new monophase receiver. Note the small adjusting knob over the first dial.

N radio reception, improvements invariably come through the attempt to force each piece of apparatus forming the whole to work at greater efficiency. The best set, that is, the one which will bring in the most DX and at the same time give the clearest and most pure reproduction of sounds, is the one in which every component is functioning at its best.

is functioning at its best.

This line of investigation—constantly working toward deleting the losses from each piece of apparatus—has been responsible for all the recent advances in the field of radio frequency amplification design. From the old transformer coupled stages we have progressed to the tuned steps, and then to the neutralized type. Each of these advances in design served to eliminate some particular loss in the set. The transformers were in-efficient in their transformers were in-efficient in their transformers were indesigner conceived the idea of substituting the tuned method of transfer for the old transformer method.

CONTROL

Here another difficulty arose. Something had to be done to control the oscillating characteristics of the tube, since the small inter-element capacity often forced it into oscillation on account of the proximity of wave-length values between the grid and plate circuit of the tube. A losser in the form of a potentiometer was inserted in the circuit to damp out these unwanted oscillations.

Then along came the Neutrodyne with its neutrodons which served the same purpose, i.e., to stop the deleterious effect of the capacity of the tube. This method was infinitely more effective from the standpoint of operation than the old potentiometer method of controlling the tube.

Then, independently and about the same time, the superdyne principle was brought out. This method is nothing more nor less

THE MONOPHASE set described in this article was constructed in the Radio News laboratory and was subjected to a very thorough test. The operation was very satisfactory, and we recommend it to our readers as an interesting and promising circuit for experiment.

It is exceedingly selective and does not radiate when properly adjusted. Considerable care should be exercised in adjusting it, however, for if the adjustment is not made properly it becomes a powerful squealer.

The set can be logged very accurately, and will bring in all the DX that one could desire. In fact, it compares very favorably with any set we have heretofore tried. The selectivity was such that it was an easy matter to tune in WEBH (Chicago) through WHN (New York), a difference of 10 meters in wave-length, and a difference of only two divisions on the dial.

Many distant stations were logged in the RAIDO NEWS laboratory, which happens to be located in a very unfavorable spot for such testing, on account of the shielding effects of the large steel buildings. in downtown New York.—EDITOR.

than reversing the tickler so that its power is turned back into the grid circuit in the reverse direction. This serves to damp out the signals rather than build them up, as is the case in the ordinary regenerative set. But, in order to make the radio frequency tube operate at its greatest possible efficiency, its plate circuit is tuned so that some regeneration is obtained and the tickler is used to control the oscillation characteristics of the tube.

of the tube.

This circuit is one of the best, tube for tube, that has ever been brought out. The great difficulty with it and the reason it has never gained a wide popularity was the trouble encountered in operating it. A great deal of practice and patience is necessary, and the ordinary broadcast listener, when he has a family that wishes to enjoy the product of the radio set, is loath to install an instrument so fraught with difficulties.

Now comes an improvement on the super-

Now comes an improvement on the superdyne principle which circumvents the difficulties encountered in the original and at the same time retains the greater part of its efficiency.

This is the Monophase described in this

First will be discussed the theory upon which the circuit operates, in the second place the construction of the set and then its operation.

It is well known that when several stages of radio frequency amplification are employed in radio receivers there is a tendency for self-oscillation to occur in the circuits. This is due to the feeding back of radio frequency energy from the plate circuit of at tube to the grid circuit of any other tube, or to its own grid circuit. The incoming signal voltages, therefore, act as a trigger, releasing a large amount of energy stored up in the "B" batteries, which tends to drown out the signals and at the same time radiate energy from the antenna connected to the receiving station. This radiated energy causes considerable annoyance to neighbors, as well as preventing them from receiving the signals they desire.

FEED BACK

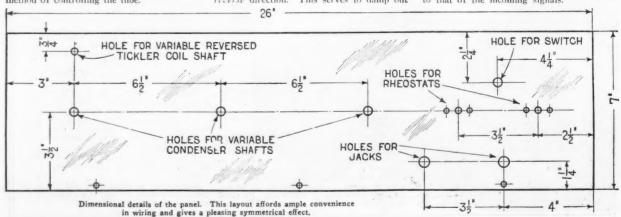
ti

ve tv

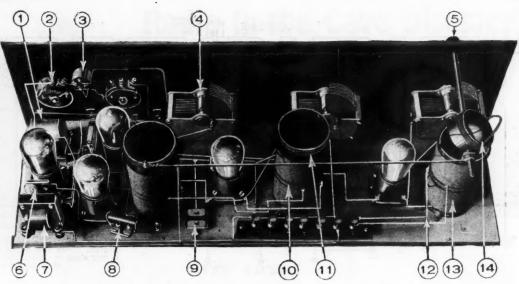
be

us an Oi

The feed-back of energy referred to in the paragraph above was accomplished either through the capacity existing in the tubes or through magnetic coupling between coils in proximity to one another. There are, in general, three ways of preventing this feedback: vis., the introduction of resistance into the oscillatory circuits, neutralization of the tube capacity or magnetic coupling, introduction into the circuits of electro motive forces which have a polarity (or phase) opposed to that of the incoming signals.



The Monophase in full dress. Nos. 1 and 7 are the audio transformers; 2, filament rheostat; 3, switch; 4, variable condenser; 5, coil control; 6 and 9, bypass condensers; 8, grid leak and condenser; 10, primary winding; 11, bucking coil; 12 and 13, secondary windings, and 14, the variable coupling bucking coil.



The last method is that employed in the superdyne receiver and is also the method which has been employed in this receiver. There is a difference, however, in the way in which the circuit stability is accomplished, for in the superdyne this so-called "negative feed-back" is accomplished by coupling a coil in the plate circuit of a stage to a coil in the grid circuit, whereas, in the Monophase system the coupling is between a coil in the filament circuit and the one in the grid circuit.

The fundamental circuit diagram is shown in Fig. 1. Here the common terminal (the negative filament connection) is broken and the feed-back coil connected across the break. The polarity of the feed-back coil is to be gade such that it will prevent self-oscillation; that is, when the set is put in use, the amplification should decrease as the coupling is increased. When the coupling is loosened the amplification will gradually increase up to the critical point, at which oscillations will occur.

It has been generally noticed that in regenerative receivers, more especially of the three-circuit tuner type, changes in the tickler coupling will change the setting of the tuning condenser. In this arrangement, however, the coupling between the feed-back coil and the coil in the grid circuit is made very loose, so that the reaction between the two circuits is very small. This loose coupling prevents the tuning circuit from being appreciably affected by the setting of the feed-back coil, so that the tuning of the set will always remain nearly constant.

Fig. 2 shows the complete wiring diagram of the set. Three such feed-back coils are used, one for each stage of radio frequency amplification and one for the detector circuit. One might think that by using so many

adjustable parts, the operation of the set would become very complicated. Such is not the case, however, for it will be found that two of the feed-back coils can be left untouched once they are adjusted, so that the number of tuning controls in the set is reduced to the three condenser dials and one dial for adjusting the first feed-back coil or compensator.

or compensator.

The idea is that the second stage of R.F. amplification is adjusted on the long waves, so that, as the feed increases with the short waves, there will be less tendency for oscillations. That is, the set is tuned in on the longest wave it is desired to receive, say 600 meters, and the second and third compensating coils adjusted carefully to the point at which howling just ceases. After this, they can be left alone, for on all wavelengths shorter than this there will be less tendency for self-oscillation to occur, on account of the increased negative feed-back on the shorter wave-lengths.

AMPLIFICATION

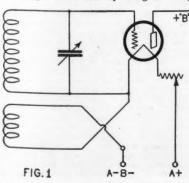
The amplification in these stages will always be high, however; in fact, it will be very close to the amplification obtainable at the critical point, for exceedingly small adjustment of the compensators is necessary to start or stop oscillations. After the second and third compensators are properly adjusted they are to be left alone and the circuits can be brought up to the critical point by manipulating the first compensator alone.

The photographs show the arrangement of the apparatus in the set. There is nothing unusual in the general layout, except that the spacing between the several coils is rather generous and the rest of the apparatus must be of good design. The audio frequency end of the circuit is the same as usual.

There is an interesting point in connection with the placing of the feed-back coils which deals with their position with respect to the secondaries of the tuning units. It will be noted in this circuit that the compensator is placed at that end of the secondary coil which is connected to the filament. There is a very good reason for this, it being that the controlling is done at the low potential end of the coil, and the adjustment of the compensators will not be so critical.

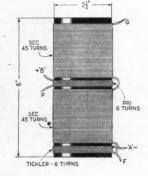
This is contrary to the general practice of placing ticklers at the grid end of the coil, but this latter is done in cases where it is desired to increase the regeneration by tightening the coupling. Again, it must be remembered that the third winding is not similar to the reversed tickler in the superdyne, but it does create a bucking E.M.F. which acts against the oscillating circuit and produces a tendency toward damping. It will be remembered, too, that the coupling must be loosened in this circuit to increase the regeneration. It is at once evident that we are not trying to increase regeneration. The only regeneration that will exist in the receiver is that which it inherently possesses due to the natural tendencies of radio frequency amplifiers.

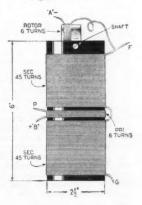
We are thus merely taking the radio frequency amplifier as it is and reducing the seriousness of its great important fault by making this fault controllable. The potentiometer does this, and so do many other devices that are in use, but in this case the efficiency of reception is not reduced, since we are not introducing a resistance loss in the circuits, but an electro-motive force in opposition to the self-generated oscillations.

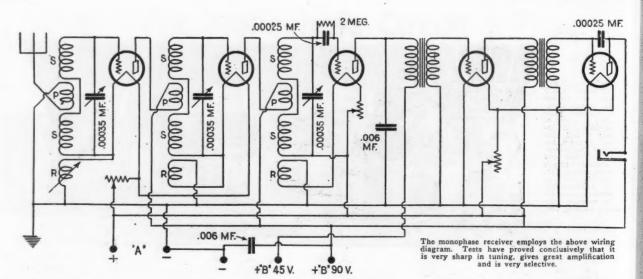


Left: Circuit diagram which is the principle of the monophase. As can be noted, a reversed feed-back coil is incorporated in the filament circuit.

Right: Details of the radio frequency coupling transformers. Two of the first type and one of the second are needed.







The construction of the coils to be used in this receiver is a very important one. The general construction can be readily learned by following the text of this article with one eye and the sketch shown in Fig. 3 with the other.

CONSTRUCTIONAL

The first step in assembling this receiver is to procure the best of the necessary materials. A 7×26 -inch panel and a 7×24 inch baseboard are fastened together in the customary manner, after the panel is drilled with the necessary holes, as shown in the diagram.

The construction of the radio frequency The construction of the radio frequency transformers is not a difficult one. Three bakelite or hard rubber tubes 2½ inches in diameter and 6 inches long are required. There are wound 45 turns of No. 22 D.C.C. wire. A 6-turn winding of the same size wire composes a primary winding ½ of an inch from the first winding. The secondary winding is then continued for another 45 turns. The compensating coil is next placed on the tubing and consists of six turns of wire wound in the opposite direction to that of the other windings. Two small brackets are used to fasten the radio frequency transformers to the baseboard.

The above description pertains to two of the transformers, the third being slightly different in that the compensating coil, in-stead of being wound on the tube itself, is placed on a small rotor at one end of the tube. This rotor is a piece of bakelite tubing two inches in diameter and one inch long, at one end of which is placed the six-turn winding. It is not necessary that the wire be wound in any specific direction, since the coil can be readily turned through 180 degrees and thus change its polarity.

The wiring of the receiver is not very difficult, since there are no set rules, except that careful work brings good results. In case trouble is experienced from the beginning, the connections to the compensating coils should be reversed one at a time until the undesirable oscillations are eliminated. It will be found advisable to place two bypass condensers across the "B" battery and also to use a .00025 mfd. condenser between the grid and plate terminals of the last audio frequency amplifier tube.

was found that 20-ohm rheostats, of which three are required, gave the necessary critical adjustment and added remarkably to the sensitivity of the set.

As regards the selectivity of the set, it is safe to say that it surpasses the majority of those on the market today. In sensitivity, too, due to the exacting values of the apparatus used and the correct engineering principles involved, the receiver stands as a big step in the development of tuned radio frequency sets.

As will be noted, the coils are fully 61/2 inches apart, reducing to a minimum the tendency towards inter-stage coupling with re-sultant oscillations. Two stages of audio frequency amplification will be found to give more than sufficient volume, it being necessary to incorporate a by-pass condenser across the grid and plate terminals of the last tube.

Radio As A Life Work

DISCOURSING on radio as a vocation, Dr. J. H. Dellinger, Chief of the Radio Laboratory of the Bureau of Standards, recently said: "The idea that radio offers a short cut to wealth with little work can be dismissed at once. There need be no 'forty-niners' rush to the 'gold fields'," continued, explaining some of the mistakes which prospective engineers, salesmen and inventors may make, unless they pause before they leap into this world wide industry.

before they leap into this world wide industry.

"Radio in its various phases has become a large and expanding industry. At the present moment there may be a slightly greater return for those engaged in constructing, engineering, selling and otherwise creating radio goods, than in other fields. But it by no means follows that the same skill or initiative or brains or personality or work put into radio will yield more money than in anything else during the next 10 years. in anything else during the next 10 years. It has been said that the opportunities in It has been said that the opportunities in radio are a thousandfold greater today than 10 years ago. Yes, but if there are a thousand times as many people in it, the opportunity for each one is now exactly what it was then. The laws of supply and demand work rather fast. I am somewhat inclined to third that the present procedure. to think that at the present moment people are going over into radio a little faster than the total number of existing opportunities warrants. This opinion may be wrong; a similar opinion might have been held of the automobile industry five to 10 years ago, and yet the automobile industry is by no

means today strewn with the wrecks of blighted careers.

"Considered as an opportunity to do satisfying work and to give service, radio has great attractions. Bear in mind that radio as a vocation is very different from radio as an avocation. As an avocation or diversion radio has its greatest hold at the present time. Indeed, one disadvantage of radio as a vocation is that you are thus denied it as an avocation. I know some people won't agree with me on this. They think they can work at radio all day and get their diversion from it in the small hours of the night too. But, of course, a person's interests and thought are bound to become one-sided when he denies himself the relief that a true avocation supplies.

"Probably the chief satisfaction that the worker in radio derives is the certainty that he is in a growing, a valuable and an appreciated service. Only a few years now until world-wide telephony will be a reality. By a combination of wire and radio, people will converse across the oceans, and regular means will be provided to broadcast important speeches that will be heard simultaneously in every country on the globe. What further achievements there will be, only the imagination can suggest. Whether a worker be engaged in radio science, engineering, selling, publishing, operating or programming, he can feel that his contribution to these conquests is an essential one. Another fine thing about work in radio is that it "Probably the chief satisfaction that the

leads inevitably to a widening of the horizon and a viewpoint not limited by national or any other boundaries. As the radio waves themselves spread out into all lands, so must

the thoughts and plans of the worker in any of the branches of radio.

"It is only when we consider the several branches of radio that we come really to think definitely about radio as a vocation. You can't very well just go into radio. It must be radio operating research engineermust be radio operating, research, engineering, broadcasting, manufacturing, selling or publishing. The interest in radio is so great that an unlimited amount of information has become available, in magazines, in books, in schools, to all who wish to become learners. What a person can learn in any of the fields of radio work, first from these sources, and second from his actual experience in the job, is limited solely by his capacity for

job, is limited solely by his capacity for absorbing information.

"Formal training is a great help to the worker in any of the fields mentioned. Not that the college or school course of itself makes the man or brings greater rewards. It simply gives a greater knowledge of the subject and a broader grip on the implications of the subject and its place in the whole scheme of life, so that the trained man can more readily profit by new developments and perform services of real value in unforeseen circumstances and thus take advantage of opportunities. The particular branch of radio that one should enter depends on his natural bent

pends on his natural bent



By C. W. WILLIAMS, RADIO,9CSO

ENTRANC

This layout shows graphically the role of radio in the recent Collins tragedy. At the top is the electric generator; a map of the cave is in the center; a hook-up of the radio arrangement used also, and a picture of Collins at the bottom.

RADIO NEWS is privileged to present here exclusively the log of Mr. C. W. Williams, Radio 9CSO, who was in charge of the radio installation at Cave City, Ky., in connection with the recent Collins disaster. He gives full details of the work that was done and the methods used.

HEN there is dire danger, radio usually finds a place in the scheme of rescue. So it was simply more than logical that the newspapers carried accounts of the radio installation which kept the anxious watchers who held vigil outside the cave-prison of Floyd Collins, hopeful and working.

But none of the daily press carried a de-

scription of how the installation was made or operated. Below I present a full radio log of the days preceding Collins' death

2 - 0 e - r

es st 13

to

It

or

as in

ds

ds.

log of the days preceding Collins' death and how radio played so important a part, keeping the rescuers hopeful, and advising the doctors constantly of Collins' condition.

Mr. Lane, who has charge of the Delco lighting system at Sand Cave, called me over the telephone and asked if I could use any radio apparatus or amplifiers on the lighting circuit running back to Collins, so as to determine whether or not he was moving or living. He advised that a 25-watt lamp in a weather-proof socket had been placed on Collins' chest with blankets over and underneath the lamp, and that the cirand underneath the lamp, and that the circuit had only this one lamp in it inside the

POWER AMPLIFIER 000000 000000 -6 V SWITCH TO LAMP ON COLLINS

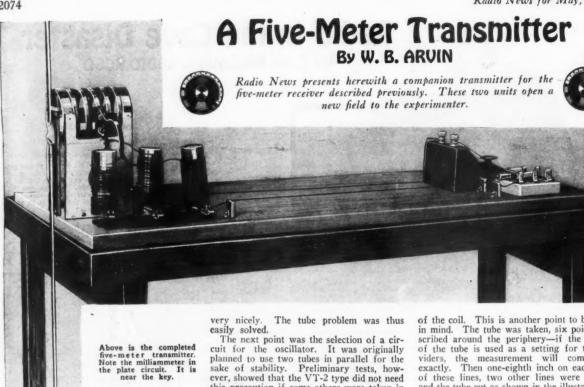
> He also stated that the connections where the weather-proof socket was connected to the No. 10 insulated copper wire from the lighting circuit were very loosely made up, and this is the point I worked from.

CONNECTIONS

I took the following apparatus back in the cave far enough to be away from any outside noise, cut the lighting wires and connected up the apparatus as shown in the accompanying diagram. The apparatus used accompanying diagram. The apparatus used was a three-stage power amplifier, using 201-A tubes with 90 volts on the plate and 6 volts for filament from storage battery. The wires going to the lamp on Collins' chest were connected in series with the primary of a G-E audio frequency transformer and four three law for the colling of the primary of the cells 6 volts and a milliameter. and four dry cells, 6 volts and a milliameter as per diagram. The secondary of the transformer was then connected to the input of

former was then connected to the input of the power amplifier and headsets connected to the output of the amplifier.

After determining that all connections were good at the end where we were testing, and that there was not a connection or (Continued on page 2171)



VER since the first amateur work was done on the ultra-short wavelengths, there has been a constant stream of articles dealing with the construction of apparatus for the purpose of transmitting and receiving signals on these

Many of them were, of course, excellent, but were experimental in the extreme. Folbut were experimental in the extreme. Following the building of the receiver shown in the March issue of Radio News, the laboratory staff started work on an efficient and easily made transmitter to work at the same wave-length. The results are shown in the accompanying photographs.

Before any actual work was done, there were several questions which had to be any

were several questions which had to be answered. It was necessary that all these points be noted down and all the available information on the subject gathered together and digested.

TUBES

The first point, of course, was the selection of a tube which would have sufficient capacity to allow of a respectable radiation, since the set was built primarily to work over a few miles and in spite of the great amount of steel and other metals in the path of any station which attempts work in New York. A VT-2 was first used, but on account of the excessive plate voltage which it was wished to apply—in order to radiate the greatest possible amount of energy—a brush discharge occurred at the press in the tube where the plate and filament leads entered the glass.

Of course, it is hardly necessary to men-tion in connection with short wave work that the first step in preparing any tube for work is the removal of the base. The VT-2 worked admirably when the plate voltage was kept below 500. Through the courtesy of the DeForest company, the laboratory obtained two tubes with separate plate and grid leads brought out the side of the tube. A thousand volts was put on the plate and the milliammeter jumped to 126 mils plate current. Of course, the radiation increased this precaution if some others were taken in the construction of the set.

After several different circuits were tested, the one shown (a coupled Hartley) in the

accompanying diagram was hit upon and accompanying diagram was nit upon and proved to be the most satisfactory from every point of view. Aside from its electrical characteristics, it has the very distinct advantage—from the short wave point of view-of lending itself admirably to the mechanical design.

And here is a point that is extremely important in this work. Panels, dials and everything possible that is not directly necessary to the correct functioning of the set should be deleted once and for all. The should be deleted once and for all. The least of every substance but air and ether in the immediate neighborhood of the transmitting and receiving apparatus is a condi-tion of affairs much to be desired. Therefore, the precaution noted here, Cut out everything! It is never a good point to sacrifice neatness and symmetry, but in the

present case neatness, and particularly symmetry, do not fit into the electrical scheme of things.

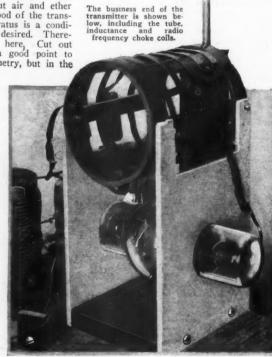
INSULATION

Then there was the necessity of insulation - not necessarily, except that the tuning and oscillatory inductances must be wound on some sort of support. Bakelite must at once be was found dismissed. It that this usually excellent stuff becomes almost a conductor at the ultra fre-quencies employed. Glass was found to be good, but at once obvious difficulties arise in the matter of working it. Hard rubber was finally selected and proved to be good. The coils were wound on threeinch tubes which had been cut out as shown in the photographs. It is necessary, also, to have the least possible amount of insulation in the oscillatory field

of the coil. This is another point to be held in mind. The tube was taken, six points in-scribed around the periphery—if the radius of the tube is used as a setting for the di-viders, the measurement will come out exactly. Then one-eighth inch on each side of these lines, two other lines were drawn and the tube cut as shown in the illustrations.

The windings consist of two turns, one each in the grid and plate circuits. These are placed near the outside end of the tube and one-half turn is placed in the center between them for the transfer of energy to the antenna circuit. The windings were with No. 24 gauge sheet copper into ribbons, three-eighths inch wide. Ribbon is possibly the best to use in this position and it should be very wide in preference to being very thick.

The support of the tube is, of course, a question. The special tube used in this case, having two protruding ends, was suspended



between two asbestos boards drilled to take the ends of the glass. Asbestos must be used in order to withstand the heat generated when the set is in full operation.

The leads from the tubes are taken directly—as directly as possible—up to the terminals of the coil. As before, the main point in the construction of apparatus to work at such wave-lengths is extreme compactness and the absence of everything not absolutely essential to the set.

sential to the set.

By the use of a small insulating strip placed in front of the coil support, a standard for the antenna and counterpoise is permitted. In the present instance, it was fitted with two bushings into which the ends of the rods forming these two units of the radiating system could be screwed. This is a point included only to make the set a bit more handy when it is to be moved.

AERIAL SYSTEM

The rods should be in the neighborhood of 40 inches long. The actual radiated wave may be controlled by increasing or decreasing their length. No tuning device was employed in the grid or plate circuit since it was found unnecessary. The condenser across from the plate to the filament may be of small value, its absolute capacity is a matter of cut and try and is discovered by the good old method of substituting different condensers until the proper capacity is found, that is, until one is used which gives the best actual results. No grid leak was used since the grid return was made to the negative end of the filament. Many old experimenters will at once look askance at this point. The only refutation of their arguments as to its necessity is the fact that the set worked, and worked beautifully, without it. Its addition would only add to the complication of the construction and lengthen the leads. Furthermore, it is more than likely that the leakage which occurs at these very high frequencies may offer all the leak that is necessary.

In case a standard VT-2 is used as the tube, it was be mounted against a section.

In case a standard VT-2 is used as the tube, it may be mounted against a section of asbestos board similar to that used in the present case, and the support changed and put into the position of the insulating strip in the present case. Then the antenna and counterpoise may be fastened to the back of the asbestos board with the interposition of

a bit of insulating material. The coils for the oscillating circuit may be wound in the same way and the tube held, bottom up, by a couple of insulating pieces. By supporting it in this fashion, the shortest possible leads are available.

The old designer may question the length of the baseboard and the size of the choke

coils. The use of the latter is obvious. Unless they be inserted in the circuit, the radio frequency current generated by the oscillator will be flowing all over the set—if the tube is good enough to oscillate without them. They are simple in the extreme, being nothing more than 50 turns of No. 24 single cotton-covered magnet wire. The rolls of mica in them, shown in the photographs, are simply to keep them upright and reduce vibration to a minimum

The baseboard is used in the present form simply for the sake of having the set compact and complete in one unit. It is necessary on account of the capacity of the person of the operator to remove the key some distance from the business end of the arrangement, therefore, the length of the board.

OPERATION

After the set was erected and put into operation with the aforementioned 1,000 volts on the plate, the set was started up. Some difficulty was at first experienced in forcing the tube to oscillate, but once started it continued and was very dependable.

As is noticed, the key is inserted in the grid return.

In this position it works very well and there is no noticeable key click. It was tried in other locations and the present one was found to be the best after tests. A resistance and condenser may be used across it if necessary, though the chances are, such an arrangement will be found of no particular use as far as results are concerned.

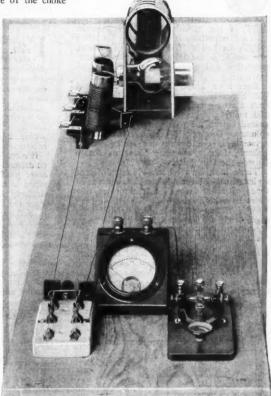
In conjunction with the receiver described in these columns a few months ago, the set was tested in the downtown district of New York. The transmitter was set up in one office building and the receiver in another, a short distance away. Communication was immediately established.

This was considered a good report for the first operation, since both buildings had extensive steel frames and there was an elevated railway structure directly in the path of propagation.

After the set was properly operating, there was the question of computing the exact wave-length at which it was operating. The only method available which would permit of any degree of accuracy was the old Leisher parallel wire method, i.e., stretch two parallel wires together, place an absorption loop on one end, couple it to the source of oscillation, and with a Neon lamp, or miniature electric light, find the voltage node by sliding the lighting device along the length of the wires until the glow is found. Following this, when the point of lighting has been well established, the distance may be measured between the two points and multiplied by four, giving the approximate wave-

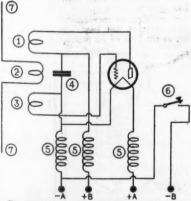
A great deal of trouble may be experi-

A view of the transmitter from the key looking toward the tube, inductance and aerial. Note the placement of the antenna and binding posts.



3

Above is a diagram of the parallel wire method of measuring wave-lengths of the five-meter transmitter. The series condensers give the necessary small capacity.



The complete wiring diagram of the short wave transmitter is given above. 1 is the plate inductance, 2 is the antenna coupling coil, 3 the grid coil, 4 the insulating condenser, 5 shows the radio frequency choke coils, 6 is the key in the grid return and 7 is the antenna and counterpoise system.

enced here unless the wires are several times longer than the wave-length. The glow will occur at several points, due to the reflection of the waves from the ends of the wire. This point is discussed to some extent by Mr. W. A. Bruno in his recent article in Radio News on short wave work.

The preliminaries having been performed, the experimental work of actual transmission over distances will be continued and the readers of Radio News will be advised of it as the results are obtained.

Note: It must be remembered that the set described here, with the antenna and counterpoise in place, may not be operated without a license from the Bureau of Navigation, United States Department of Commerce.

RADIO TO HELP AMNESIA VIC-TIMS

Victims of amnesia will be benefited by radio, if plans of wellfare workers are carried out. Persons who lose their memories and are held in various hospital wards, due to inability of authorities to establish their identification, will be presented to the general public before radio broadcast stations in the hope that their voices will be recognized by friends or relatives. A young woman in Kansas City, Mo., recently had forgotten her name and her past life. She was taken in charge by welfare authorities, and at length gave a short talk before the microphone and she was identified by persons who listened in.

The Most Novel Super-Heterodyne

By D. C. WILKERSON



Mr. Wilkerson presents an almost revolutionary principle in the Super-Heterodyne scheme detailed in the article below. Every experimenter, as well as layman, will be extremely interested in the possibilities it admits.



I is the ambition of every scientist and experimenter to produce the ultra in his line of work. That is natural, and it is the thing that makes experimentation and study in scientific work so fascinating.

Ever since Major Armstrong announced his Super-Heterodyne circuit, there has been a strong and continuous interest in it, and many novel variations of it have appeared before the public in these and other columns. One very notable variation of the principle is the circuit devised by R. E. Lacault, former associate editor of RADIO News-the Ultradyne.

There have been others. Many different styles of oscillators and detectors, and varied types of radio frequency transformer cas-cades have been tried out. Some have been built for antennae and others have been made solely for loop aerial work.

THE STANDARD TYPE

The customary style of Super-Heterodyne common among those who build their own, has eight tubes in straight amplification work. There is a first detector and oscillator, a three-tube cascade of radio frequency, a second detector and two audio fre-

Output

9-10 V.

150

Ohms

SKETCH B (SECTION 1)

.001

-111111

45-5V.

1111

Pot. 400 Ohms

R 150 Ohms.

15-20 V.

IN publishing Mr. Wilkerson's article, we must make it plain that this is as yet a theoretical circuit. Although Mr. Wilkerson has done quite a good deal of experimental work on the circuit, much remains to be done

Another article, giving more data on results, will be published in a forth-coming issue of RADIO News, this article also being written by Mr. Wilkerson.

We are publishing the article chiefly on account of its novelty. It embodies some good ideas and the readers are given much food for thought, par-ticularly those readers who care to leave the beaten path. We are all apt to follow along somewhat the same lines, and it is most refreshing to stray afield once in a while.

quency amplifiers. This requires first of all

a large panel and a long one, and a consider-

Coming into vogue today is the application of the reflex principle, and

able amount of accessory instruments

Heterodyne which shall not radiate, which shall not be factory made and which shall incorporate something new in the way of contribution to the art, we are confronted with these things:

1. We will not fool with reflex. Practically everyone else has, and we would not, therefore be traversing virgin ground.

2. We must consider deeply some way to avoid oscillation in the first detector. Here is where radiation can start.

3. We must prevent spilling over from the oscillator circuit which heterodynes into the master circuit.

We must stop all oscillating tendencies arising from faulty radio frequency con-struction, feed-back from second detector circuits and throw-overs from the audio

CRYSTAL DETECTOR

The first consideration then is to eliminate oscillation from the first detector. A bold stroke here would be to substitute for the customary tube at this point, a crystal, or else some other detector which would not and could not oscillate.

Right here and now, this writer is going to "start something." He is going to try out the much despised and little used electrolytic detector. Don't laugh at this. Just remember that the first real and reliable distance transmission and reception records in wireless were due to the success of this type

This writer remembers, many years ago, in 1910 and 1911, when the present editor of this magazine, Mr. Hugo Gernsback, was piloting his first radio publication, MODERN ELECTRICS, and how the introduction on the market of the old E. I. electrolytic detector made great distance records for the amateurs. This device had a small Wollaston wire (a very small diameter platinum wire) with adjusting means, to dip into a carbon cup filled with weak muriatic acid solution.

ingenious designers are get ting double work out of their tubes by clever handling of reflex ideas. The application of reflex to the Super-Heterodyne, however, is simply carrying out the old adage, "Every little bit added to what you've got," and the true meaning of reflex-plus-super is only to reduce the number of tubes required to run the set. There are so many and

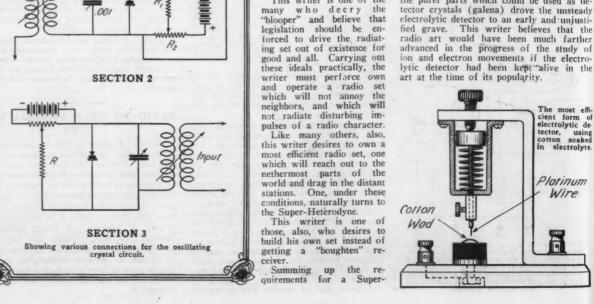
we are discovering that many

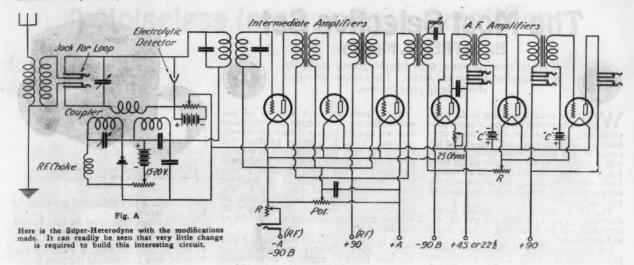
varied adjuncts to the art of radio that one is always at a loss to know what principles or instruments when a certain result is desired.

This writer is one of the the which will not annoy

ELECTROLYTIC DETECTOR

The wide prevalence of lead-sulphite ore, the purer parts which could be used as detector crystals (galena) drove the unsteady electrolytic detector to an early and unjustified grave. This writer believes that the radio art would have been much farther advanced in the forcement of the tradeof advanced in the progress of the study of ion and electron movements if the electro-lytic detector had been kept alive in the





Another reason for the early demise of the electrolytic detector was that it had to have a steady table, undisturbed by jolts, swings or jars, such as encountered at sea, to perform its best. Upon what tiny things does the fate of ideas rest! If these early electrolytic pioneers had only done what this writer had done, put a small ball of ab-sorbent cotton soaked in the electrolyte in the carbon cup. No matter how much the ship rolled, we always had contact, and the old Wollaston wire brought in the message. The tiny fibres of cotton clung to the platinum wire and seemed to improve the character of reception.

Then, we are going to try out electrolytic eans in a first detector. So far so good. means in a first detector. How about the oscillator?

io

d

ot

g

De

or

as

he

or

011

e)

on

11.

re.

dy

he

er

of

he

Surely we will have to eliminate for good and all any chance of undesirable oscillation from this source so we will also dispense with the oscillator tube. I like being original, anyway. There's nothing What can we get to do oscillation work with? How about one of those fixed crystal quartz oscillators?
This would give us a nice continuous frequency without variations. y without variations. How would we this frequency, though? We'd have to devise some means of tuning which would bring the resultant oscillations within the super-audible frequency peak of the inter-mediate stages of radio frequency amplifica-

A quartz crystal is not the only means by which we may obtain oscillations to hetero-dyne the incoming signal down to the proper

frequency range.

There are many kinds of odd oscillating mediums, but few are adaptable to the reception of modulated signals. Let's look around. How about another relic of radio's forgotten graveyard? How about trying out the old piece of zincite and a steel needle contact? Lossey, the celebrated Russian scientist, has accomplished some remarkable results with different crystals, having produced amplification and many other radio phenomena, as told in the pages of RADIO News from time to time.

We will not try to devise any further means for detecting and oscillating at this Just now we have enough new material to work with.

HETERODYNE THEORY

Let's review our theory a bit. The ordinary Super-Heterodyne works on the principle that the incoming signal is used to create a flux field in a circuit, which generates a current of feeble intensity in that circuit. This current is placed in phase or in resonance with a connected circuit, where it is led to a vacuum tube grid, the impulses

being there detected, heterodyned through separate coupled oscillator circuit and then fed into a cascade of super-audible frequency stages and amplified. The output end of this latter amplifier bank is led to the input side of a second detector where the impulses are chopped down again, but this time to audible frequency, to pass on through into audio frequency stages to the final output—phones loud speaker.

Our immediate problem is to substitute for the first detector the electrolytic detector. How this is done is shown in Fig. A. So

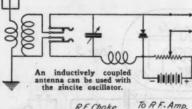
far so good.

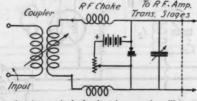
Thus far no complications have arisen. Now we are confronted with the problem of substituting an oscillating medium for the first and only oscillator tube. eral scarcity of oscillating quartz crystals, and the rather easy access to zincite crystal supplies in most parts of the United States, leads us to try out this latter means in order to lay down a plan that most any radio experimenter can follow.

The zincite-steel combination is known as

the Crystodyne detector, and it has been af-

Loop Tuner Detector 200 Ohms -1111111 loop antenna gives excellent re-sults with this super.





Another method of using the crystal oscillator as an autodyne, dispensing with a separate oscillator. The variable condenser readily governs the frequency.

forded considerable space and discussion in the columns of Radio News under the names of the editor and I. Podliasky, E. E. On page 294 of the September issue and on page 470, October issue, a good, clear understand-ing of the Crystodyne idea is given. It can be used for straight detection, for spark and arc detection, for regenerative action, for oscillation and for audio frequency amplification, as well as radio frequency amplification.

We are more interested here in the means for obtaining oscillation, and the impressing of it on the detector circuit, so that the incoming signals may be heterodyned into the intermediate radio frequency amplifier. The customary coupler is used, inductively connecting the oscillator into the detector

Fig. A shows a trial hook-up of the Super-Heterdoyne equipped with a first de-tector of the electrolytic class, and an oscilof the Crystodyne type. This hookup will not be the ultimate one, as there has not been time before this publication goes to press to work out the different association values and the circuit constants best fitted to provide oscillations.

Several different methods of producing oscillations and the way to impress them on the electrolytic detector circuit are shown in Fig. B. Naturally, the coupler and tuning condenser values will depend upon the frequency at which it is desired to operate the radio frequency stages. The writer is equipped with 45,000- and 35,000-cycle R.F. transformers, and the variable condenser value of the tuner of .001 mfd. is the one to be used under these conditions.

Section 2 of Fig. B shows a variation allowing finer adjustment of the battery voltages across the crystal, which will be found to be very critical at best.

ADJUSTMENTS

It has been found, thus far, that a sharp click will be noted if head-phones are bridged across the output of the oscillator when it is on the job as such. When it is not oscillating, the click will not be noticed.

The potentiometer adjustment allows considerable leeway in changing the oscillation frequency of the zincite-steel combination. A Victrola needle pressed tightly against a zincite crystal gave the best preliminary re-

Filing off the crystal or digging out a small pit in which to seat the steel point gets better and more positive results.

The theoretical considerations involved in the operation of this type of oscillator are too broad to be gone into in a short article such as this. The solution of the practical (Continued on page 2132)

The Most Selective Set

With the reassignment of wave-lengths recently made, the more selective a set is the better. The receiver described should be of great interest.



ITH the constant increase in the number of broadcast stations in every populous city, the question of receiving anything but the most powerful local station becomes of the utmost importance. In fact with a majority of the sets now on the mar-In fact. ket, it is almost impossible to get an out-oftown station operating on a wave-length anywhere in the immediate neighborhood of the locals.

The set described in this article is un-

doubtedly the most selective one possible, incorporating at the same time no new device

and very simple tuning.

Let us see first how the idea incorporated in the design is arrived at from well-known principles and adaptations. Examine Fig. 1 carefully. It will be seen immediately that it is the well-known tuned impedance coupled receiver consisting of one stage of radio frequency amplification and detector. The antenna circuit is of the shock excited type which is finding more and more favor with everyone because of its advantage in helping to reduce the number of controls. It might also be worth while to mention that the antenna circuit is known as an aperiodic one; that is, one which is not tuned to any particular wave-length.

Besides the fact that the primary inductance contains but a few turns of wire, it is variable in coupling to the secondary or grid circuit. This feature enhances the possi-bility for the elimination of undesirable in-

terference.

It will at once become apparent that maximum transference of energy from the antenna circuit to the grid circuit of the first tube will not occur, due to, first, the small number of turns, and second, to the loose coupling. However, this condition does not appreciably affect the DX ability of the set. In the case where considerable trouble is

In the case where considerable trouble is experienced from nearby stations, the antenna system can further be altered by the insertion of a wave trap such as that depicted in step 1, Fig. 1. This trap circuit made up, preferably of a coil and variable condenser the constants of which the range of wave lengths to be received should cover. of wave-lengths to be received should cover from 200 to 600 meters approximately for the broadcast waves. Having adjusted C₂ and C₂ for the desired station and still experiencing interference, C₃ is slowly turned until the undesired station's signals com-pletely disappear.

Again, some will not approve of this method because it introduces more resistance into an already high resistant circuit-the True, it must be admitted that antenna. such is the case, but if reference is made to step No. 2, practically the same results will be obtained, there being manifest a very small increase in strength of all incoming signals over the case of step 1, Fig. 1. degree of coupling can be varied until all the interference is entirely done away with, without materially affecting the strength of the desired signal.

Let us now refer to the secondary, or grid circuit. Here, the very best arrangement has been found to consist of an inductance and suitable variable capacity with which to cover the desired range of wave-lengths. Again, it is sharply drawn to one's mind that the coupling between antenna and grid circuits bears a great significance in over-coming interference. If the coupling is close, there is a slight tendency towards tuning the

antenna circuit inductively by means of C.
This is highly desirable, since a maximum transference of energy will take place, but we are very limited in this respect. Absorption takes place and especially when the circuit is a regenerative one, as in this case, due to the tuned plate circuit, radiation takes place from the antenna circuit to a large degree. This is again highly undesirable because it interferes with our neigh-bors' reception. Rather than change the grid circuit then, let us now turn to the plate circuit.

It has been found that tuned impedance coupling is far superior to untuned or choke coil coupling. Whereas the latter method (which can be consummated by removing Whereas the latter method the variable capacity C₂ from across L₂) will readily cover a wide range of wave-lengths, it is strictly aperiodic in nature and best results will be obtained from it only at resonant frequency. In tuned impedance coup-ling, we have the advantage of being able to tune to resonance and thus get maximum signal strength. But again, we run into the difficulty of eliminating undesirable oscillations. Having both a tuned grid and a tuned plate circuit, ideal conditions for self-

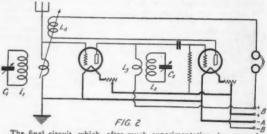


An inductance and variable condenser com-prise a unit which can be used as wavemeter or wave-trap.

oscillation in a tube exists and are normally hard to overcome.

Why not then apply what we have learned concerning the antenna circuit and incorporate it into the plate circuit? Refer now to step 3, Fig. 1. Here, a relatively few turns of wire L₆ constitute the plate inductance, connected in the usual manner similar to a larger coil, as an untuned choke coil. With a variable coupling augmenting it, a similar wave trap to the one in the antenna circuit is placed in inductive relation to it.

From previous experience, everyone knows that an inductively coupled circuit is by far more selective than one conductively coupled. We have applied what we found to be true



The final circuit, which, after much experimentation, has proved to be the most selective one ever constructed.

in the antenna to the plate circuit and are bound to secure better results.

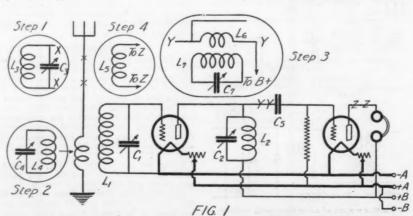
Step 4 shows that we can add regeneration very nicely and reaps its benefits both in increased selectivity and signal strength.

We, therefore, come to Fig. 2, where is depicted the complete circuit, somewhat revised in that the antenna inductance is directly connected to the grid circuit of the first tube. This is done because it was found that the combination of both traps-more correctly, the closed oscillatory circuit coupled to the antenna is a wave trap while that coupled to the plate circuit is more properly termed an inductively coupled variable reactance, whose function is to increase the effective plate inductance, L_n, as L_n C₂ is brought into resonance with the incoming frequency, thus again allowing increased selectivity and sensitivity of the system so greatly that it is only optional to incorporate an inductively coupled input circuit which means an extra control.

To tune the circuit, the antenna wave trap is tuned to the incoming interfering wave so that it can be completely absorbed. All frequencies other than this will readily pass through the antenna circuit and onto the grid of the first tube. Of course, it is desirable to tune in but one station. L₂ C₂ is then adjusted to resonance with the incoming desired wave and its coupling varied in relation to L₃ for the purpose of controlling the conditions for self-oscillation. Having received a maximum signal, L₄, the tickler feed-back coil is coupled to the antenna coil

until again best results are obtained.

As many as three stages of radio fre(Continued on page 2182)



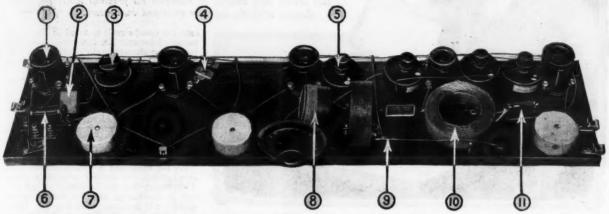
A circuit using one stage of radio frequency amplification coupled to a non-regenerative detector by the tuned impedance method. Note various ways of improving the selectivity of the receiver.

A Noiseless Intermediate Amplifier

By G. C. B. ROWE

The present amplifier will be found exceptionally valuable on account of its characteristics which tend to cut out the noise and at the same time increase the selectivity of the complete set.





Layout apparatus on baseboard. Above is a view of the laboratory layout of the new interference eliminating amplifier. 1 is the second detector socket, 2 fixed condenser across the secondary of the last tuned intermediate frequency transformer, 3 rheostat, 4 another intermediate condenser, 5 condenser for tuning the intermediate trap, 6 grid leak, 7 intermediate frequency transformer, 8 tickler, coupling the plate circuit of the second detector to one of the trap coils, 9 resistance, 10 trap coil, 11 grid leak and condenser. Layout apparatus on baseboard.

ITH the advent of summer time, the bug-bear of static and atmospheric noises comes to the fore again. The users of the Super-Heterodyne are confronted with this nuisance more than the same listeners with other types of sets, since the intermediate frequency amplifier employed in it tends to pass more miscellaneous noise than straight tuned radio frequency sets or those of the single circuit class on account of the low frequency to which the intermediate stages are tuned.

The principle involved is simple in the extreme, being a combination of resistance coupling amplification with the addition of a sort of trap circuit in the form of a tuned circuit placed across the connections between the separate stages working in conjunction

with the resistance coupled amplifier.
With the addition of small value blocking condensers in the grid and plate circuits, two of the tubes function as detectors on the low frequencies, those in the audio range, while giving intermediate frequency amplification to the desired signal. Through this process of elimination, practically every wave-length but the one desired is cut out before the sig-nal reaches the second detector and the audio frequency stages.

By referring to Fig. 1, the action of the

circuit may be easily explained. The first detector and oscillator are of the standard type. No deviation from the regular Super-Heterodyne hook-up is noticed until the first tube of the intermediate frequency is reached. A standard transformer is connected between the first detector and the first intermediate frequency tube. The grid circuit of this tube functions in the standard fashion.

In the plate circuit, however, the connections are changed. Instead of the inter-mediate frequency transformer, there is a resistance, a tuned circuit and a grid leak. The action of this circuit may be easily explained.

The heterodyned signal delivered to the plate circuit of the first detector is passed through the transformer PS to the grid circuit of the first intermediate frequency amplifying tube. Here it is again amplified. It is well to note that everything passing the first detector is also amplified to some extent. This includes static, atmospheric noises, other signals than the one desired on account of the broadness in tuning of the tuned grid circuit of the first tube, and a certain amount of extraneous noise arising from the transformers, the tubes and the oscillator.

All this noise is amplified, but the nature of the coupling between the first amplifier and the second tend to reduce it in the following manner: The condensers C2 and C3 are of small capacity, .00025 mfd. or less. Experience will show that the static and tube noises are of audio frequency and are usually loud in ratio to the signal intensity. Therefore, the size of C₂ effectually prohibits their passage onto the grid of the next tube. The only possibility left to them is to take the alternative path through the resistance. sistance R₁, which is approximately of 25,000 ohms value. Here they are dissipated in the form of heat, leaving only the higher frequencies to pass on.

Now the desired signal at the intermediate frequency, in this case 6,000 meters, passes through the small condenser with relative through the small condenser with relative case and travels on its way toward the grid of the next amplifier. And here is where the trap circuit L₄ C₄ comes in. This circuit is tuned exactly to the intermediate frequency by the cut and try method, i.e., using a small variable condenser or else adding or subtracting turns from the inductance. When the signal reaches this point, with the oscillatory circuit tuned exactly. point, with the oscillatory circuit tuned ex-actly to the intermediate frequency, all that part of it which is not in resonance with the trap circuit dissipates itself by following the inductance to the grid return.

(Continued on page 2187)

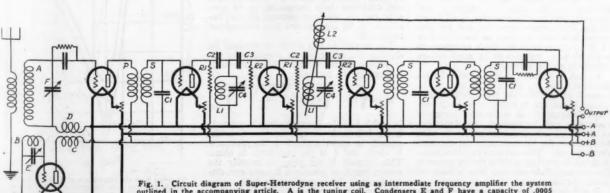
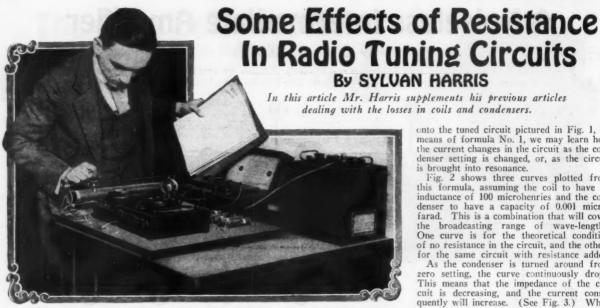


Fig. 1. Circuit diagram of Super-Heterodyne receiver using as intermediate frequency amplifier the system outlined in the accompanying article. A is the tuning coil. Condensers E and F have a capacity of .0005 mfd. (23 plates), B and C are the oscillator coils and D is the pick-up coil. L1 is a 400-turn honeycomb coil and C4 is a 43-plate condenser.



Showing a few of the instruments used in making some resistance measurements in the laboratory

EARLY all radio fans are by this time aware of the disadvantages that may come in operating radio receivers when there is excess re-sistance in the receiver, but it is doubtful if their attention has been called to the many ways in which resistance can affect the operation of the set.

In considering the losses in circuits which are tuned, as is usual in radio work, the formula P = RI always comes to mind, for this equation enables us to calculate the loss of power in the circuit when the current in it and its resistance are known. In other words, suppose a current of 10 amperes is flowing in a circuit which has resistance of half an ohm (0.5 ohm). The power loss in the circuit will then be $P=0.5\times 10^3$ or 50 watts.

The amount of power used in radio re-

ceivers seldom approaches this value, but generally expressed in microwatts, or millionths of a watt. Some conception of the magnitude of the watt may be obtained by remembering that 746 watts are equivalent to one horsepower.

In radio receivers, where we are dealing with such minute quantities of power, it is very essential that every bit of this power be utilized, for the loss of a small amount of it may represent a considerable portion of the total power coming into the antenna from the transmitting station.

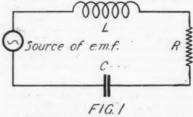
DESIGN

The proper design of radio apparatus, directed by the ideas of efficiency and economy, requires the reduction of all losses to the least amount possible, and for this reason it is well to obtain an understanding of the various ways in which resistance in circuit acts, and also as to what factors contribute to the resistance.

In making a study of this, it must be re-membered that the values to be used in the formula given above are the high frequency values, which are in existence when the re-ceiver is operated. R is the high frequency resistance, and furthermore, the frequency at which the measurements are made must be specified, for the resistance changes with the frequency. This has been explained more in detail in previous articles by the writer in the January, February and March issues of RADIO NEWS.

It will be found that the actual resistance of a coil added to the circuit depends some-

what on the coil's position in the circuit with respect to other apparatus. This does not refer to coupling effects through magnetic or electrostatic fields, which may result from having the apparatus too close together, but refers to the actual diagram of connections. This will be brought out clearly as we proceed. In many cases the particular piece of apparatus may act as if its resistance is



A simple series circuit consisting of a resistance inductance and capacity in series with a source of e.m.f.

higher than it really is, thus giving rise to the expression "apparent" resistance.

SERIES CIRCUIT

To begin the discussion, let us consider a simple series circuit, as shown in Fig. 1, consisting of a coil and a condenser connected in series with a source of energy. This source of energy may be any generator of high frequency current. Both the coil and condenser have resistance, so, to simplify matters, we have assumed all this resistance to be concentrated into the resistor

The current in this circuit is obtained by dividing the voltage of the generator by the impedance of the circuit. This impedance is given by the formula

$$Z = \sqrt{R^2 + \left(0.00628 fL - \frac{159.3}{fc}\right)^2}$$

in which f is the frequency in kilocycles, L is the inductance in microhenries, C is the capacity in microfarads, R is the resistance ohms, and Z is the impedance in ohms. This formula is not given to mystify the reader, but it is presented because our discussion uses this formula as its basis.

If we have a certain signal coming into the antenna, impressing a certain voltage

onto the tuned circuit pictured in Fig. 1, by means of formula No. 1, we may learn how the current changes in the circuit as the condenser setting is changed, or, as the circuit is brought into resonance.

is brought into resonance.

Fig. 2 shows three curves plotted from this formula, assuming the coil to have an inductance of 100 microhenries and the condenser to have a capacity of 0.001 micro-This is a combination that will cover the broadcasting range of wave-lengths. One curve is for the theoretical condition of no resistance in the circuit, and the others for the same circuit with resistance added.

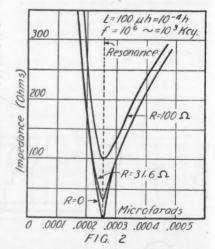
As the condenser is turned around from zero setting, the curve continuously drops. This means that the impedance of the circuit is decreasing, and the current consequently will increase. (See Fig. 3.) When the circuit is exactly tuned to the incoming frequency or wave-length, the impedance of the circuit is a minimum and the current a maximum. The curve for the circuit of zero resistance drops all the way to zero impedance. If it were possible to have a circuit of zero resistance, the current existing in the circuit when resonance is attained would be enormous, even with small im-

pressed voltages.
When there is resistance in the circuit, however, the impedance cannot drop any lower than the value of that resistance. This is the lowest point of the upper curves in Fig. 1. Besides this, the curves do not come to as sharp a point as the lowest curve.

These same curves are plotted in Fig. 3, but here, instead of using the impedance for the vertical scale, we have used the admittance, which is the reciprocal of the impedance (or admittance = 1 ÷ impedance). This gives a graphical idea of how the current varies in the circuit as the condenser is turned. The current is small for the greater part, but as resonance is approached,

it mounts to relatively high values.

The curves for the circuit with resistance do not go nearly as high as that for the circuit with no resistance, which theoretically would have no topmost point. Furthermore,



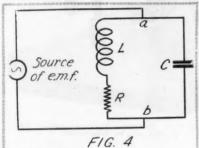
Showing how the impedance of a simple series circuit changes with the setting of the tuning condenser. This is for a certain incoming wave-length, viz., 300 meters.

the greater the resistance, the flatter will be the curve, so that it will be difficult to tell exactly where the peak of the curve is. This is the reason for broad tuning, and illustrates clearly an important reason why resistance ought to be kept out of tuning circuits.

The series circuit we have been discussing is the same as the antenna circuit consisting of the antenna capacity in series with the inductance of the tuning coil. It is also the same as the secondary circuit (or nearly so), which has likewise a coil and condenser in The electromotive force in each case series. is regarded as in series with the rest of the circuit, although in the secondary it originates in the windings of the coil.

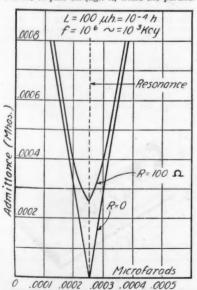
PARALLEL CIRCUITS

The reverse conditions are found in the case of parallel or shunt circuits, such as we



A simple parallel or shunt tuned circuit con-nected in series with an e.m.f.

have in wave-traps or filters. Fig. 4 shows such a circuit in which a coil and condenser are connected in parallel and the combination connected in series with the source of energy. The formula for this case is rather complicated and will not be given here, but in Fig. 5 are shown curves plotted from it. The two curves shown are for a circuit like Fig. 4, with and without resistance. These are to be interpreted the same as the curves of Fig. 2. It will be noted, however, that in Fig. 2 for the series connection the impedance is zero at resonance, while in Fig. 5. the admittance is zero at resonance. means that when tuned to resonance, the series circuit will permit a maximum of current to pass through it, while the parallel



F1G. 5 Showing how the current varies in a parallel tuned circuit. Compare with Fig. 2.

circuit permits a minimum of current to

When there is resistance in the circuit, the series circuit does not permit as much current to pass as it should, and the parallel circuit does not cut the current down as much as it should. Moreover, in both cases, it is difficult to find the maximum or minimum points, with the result that the tuning

RESISTANCE AFFECTS FREQUENCY

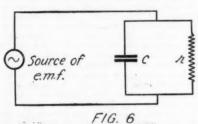
There is another effect present in tuned circuits which has considerable resistance that is generally overlooked, and that is, in parallel circuits the presence of the resistance causes the natural frequency or wavelength of the circuit to be different from that which would be calculated from the usual formula: 1

$$f = \frac{159.3}{\sqrt{16}}$$
 (2)

in which f is the frequency in kilocycles, is the inductance in microhenries, and C is the capacity in microfarads. The exact formula is

$$f = 159.3 \sqrt{\frac{1}{LC} - \frac{R^2}{L^2}}$$
 (3)

in which R is the resistance of the coil, and the other symbols are as above. Thus, if we have a coil of 100 microhenries, and our condenser is set to 0.000253 microfarads, if the circuit had no resistance, it would be tuned to a frequency of 1,000 kilocycles (300 meters) as calculated by equation (2). If, however, our circuit had a resistance of 100



Circuit diagram equivalent to a leaky condenser, showing the capacity of the condenser in shunt with the resistance of the condenser.

ohms, its frequency, as determined by equation (3), would be 988 kilocycles (304 meters). To tune the circuit to exactly 1,000 kilocycles we would have to use a

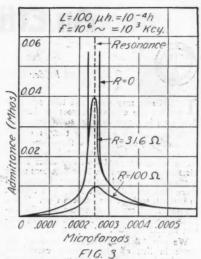
1,000 kilocycles we would have to use a trifle more of our condenser.

Of course, this change of wave-length is not serious, for we can always make the necessary adjustment by tuning the condenser; in fact, we do it automatically, but it is interesting to know how many things resistance can do in a tuned circuit.

If, in Fig. 4, the capacity C should be relatively small as compared with the inductance L and resistance R of the coil, we have the ordinary conditions for a coil with distributed capacity. The mere fact that there is a small capacity in shunt with the distributed capacity. The mere fact that there is a small capacity in shunt with the inductance of the coil, causes the coil to act as if its resistance is higher than it really

The joining of several pieces of apparatus in parallel, as in Fig. 4, causes their resistances and reactances to be in parallel, and if we regard the whole combination to be *one* piece of apparatus, it is obvious that its resistance and reactance as measured between the points a and b will be different from those of the separate pieces of appa-

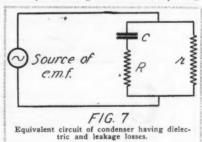
In other words, suppose we have a coil with a certain inductance, resistance and capacity. The resistance of this coil measured between its terminals will be greater than its true resistance, because the resist-



Showing the variation of current in a single series circuit, as the setting of the condenser is varied. Wave-length remains constant.

ance of the coil is associated with the other things, viz., the coil capacity and inductance. The measured resistance, reactance or inductance of the coil is called the apparent resistance, reactance or inductance, as distinguished from the true values which exist when the coil has only one of these three properties.

This point is brought out in Fig. 5a, in which the effect of coil capacity on the resistance of the coil is shown graphically. The horizontal axis gives the capacity of the coil in micromicrofarads, while the vertical axis shows how many times the true high frequency resistance of the coil has been increased by the capacity. In other words, the vertical axis is the ratio of the high frequency resistance of the coil to its high frequency resistance neglecting the coil capacity. This curve was explained in the January issue of Rapio News. It is to be noted, however, that even for such abnormally high coil capacities as 50 micromicrofarads, the ratio of apparent resistance to true high frequency resistance is small compared with corresponding ratios due to skin-effect only. ter may run as high as 50 or 60, depending



on the size of wire and the spacing of the turns of the coil. The curve in Fig. 5a has been calculated for a frequency of 1,000 kilocycles (300 meters).

CONDENSER LOSSES

We will next consider a leaky condenser. is quite in vogue now, for everybody is talking excitedly about low-loss condensers, and are doing everything in their power to reduce the leakage through the dielectric, They are also trying to reduce the absorption in the dielectric, by reducing the amount of insulating material in the condenser. This was described in detail in the writer's article in the March issue of RADIO NEWS.

(Continued on page 2134)

An Efficient Crystal Detector

By R. HUTCHISON

This crystal holder is about as good as one could wish for, and can be built for next to nothing,



UBE sets may come and tube sets may go, but the crystal set goes on forever.

And here is a new type crystal detector.

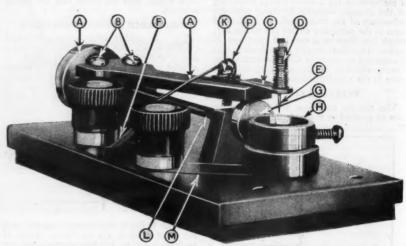
Perhaps of all apparatus that is needed for receiving radio signals, there have been more different forms employed in the detector using a crystal than any other single instrument. There have been detectors using a catwhisker in all its various forms, and there have been detectors using two crystals in contact, such as the perikon type. There are the fixed crystal detectors and the adjustable ones. And here is the floating contact crystal detector.

We say "floating contact detector" be-cause in lieu of the unstable catwhisker there has been employed a phonograph needle held by a spring that makes contact with the crystal. The contact made by the needle is so delicate that even when the cam, operating the vertical motion of the contact point, is rotated completely, the point of the needle does not puncture a piece of thin paper stretched across the crystal holder. There is also sufficient play in the spring to pre-vent the contact from being thrown out of adjustment by vibration.

The arm supporting the contact needle we will consider first, as it is a very important part. This arm A is made from a piece of spring brass, 2¾ x ¾ x ¼ inches. This is filed down so that it will be ¼ inch wide for a length of 21/4 inches.

Two clearance holes for the 6/32 machine screws B are drilled ½ inch from the wide end of A and ½ inch from the edge, giving ½ inch centers for the holes. At the other end of A, drill and tap a hole ¾ of an inch from the end for the 4/32 machine screw that fastens the flat brass piece C to the arm. In the strip of 1/32 inch brass C, bore and tap for a 6/32 machine screw and at the other end drill a hole for the No. 4 screw that fastens C to A.

The head of a ¾-inch, 6/32 machine screw



This efficient crystal holder can be made of scraps in the workshop. The letters refer to the parts of the detector and are referred to in the directions for construction.

is then removed and a hole drilled lengthwise through the screw as a needle guide, enough for the phonograph needle to slide through easily. File off all but 4 or 5 threads of the screw. These remaining threads serve the double purpose of holding the needle guide to C and as a support for the phosphor bronze spring, D. This needle guide should be soldered to the brass strip C to keep from becoming loosened.

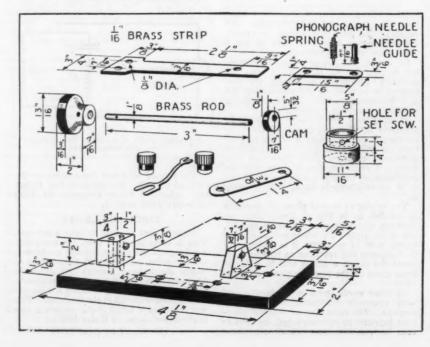
It is necessary to make a mandril for the spring D from a wire nail to give the correct diameter for the 6/32 screw. After this size has been determined, file down one this size has been determined, hie down one end of the mandril to the correct size to fit the needle. The small diameter of D must be 1/8 inch long to grip the needle firmly. As may be seen in the photograph, D is a continuous spring of the two diam-

eters mentioned above.

Next are prepared the blocks to support the arm A and the cam G. The arm supporting block F is made from the piece of bakelite or hard rubber 34 x 1/2 x 1/4 inch or two 1/4-inch pieces held together by the bolts. The arm A is clamped to the block F and used as a template for the drilling of the holes for the screws B. The camshaft bearing, is made from the bakelite or hard rubber block $\frac{1}{2}$ x $\frac{1}{4}$ x $\frac{1}{4}$ inch. This piece is filed $\frac{3}{4}$ inch wide at one end and $\frac{7}{40}$ inch remaining $\frac{1}{2}$ inch high at the other end. Through the center of these two blocks, F and M, while clamped together, drill a clear-ance hole for the $\frac{\pi}{10}$ inch brass rod L, $\frac{\pi}{10}$ inch from the top or the $\frac{\pi}{10}$ inch side. Thread one end of the brass rod, L, for $\frac{\pi}{10}$ machine screw and the other end to fit the adjusting knob N. Drill and tap for 6/32 thread the 3% inch bakelite washer G so that it will have a throw of ½ inch, which means the hole will be drilled ¼ inch off center. This cam G is screwed to the brass

The base is then prepared. Using the arm supporting block F as a template one inch from and parallel to one end, mark carefully the locations of the holes for the screws B. The screws B should not come entirely through the base, but should be about 31/4 (Continued on page 2185)

On the left are shown the details of the parts required for the detector. Above is an assembled detector with phonograph needle in position.



Oscillations and How They Are Overcome By LEON L. ADELMAN



rd

ce

d

le. 32

he

32

ch

off

355

rm

ws

ely

There has been no art, science or industry which has had such a meteoric development as radio. This article deals with some of the advances made in circuit design, especially with regard to stabilizing the operation.



ITH the fulfillment of DeForest's dream of a highly sensitive detector for radio reception, the three element tube stepped in to fill a wide breach theretofore the cause of much concern. We know now that without it uch necessities as the long distance telephone radio broadcasting, scientific apparatus and a host of other indispensable items would never have been realized.

Just how the tube functions and how it s used has been fully discussed time and again, so that it will not be necessary to say more than while it has a highly desirable property of being able to generate oscilla-ions over a very considerable range of freions over a very considerable range of the quencies, this very same property is responsible for one of the present difficulties in radio reception and design.

The day of the purely regenerative set for broadcast reception is practically over. True,

regeneration is highly desirable in all s, but regeneration without radio frequency amplification has been found to be inferior o the present day radio frequency amplify-

First came the so-called single circuit non-regenerative set. Then the two circuit re-ceiver to which was added regeneration and now known by the familiar phraseology as the old three circuit tuner. One, two and then an unsuccessful third stage of audio fre-quency amplification was added. (Old-timers will well remember a receiver comprising regenerative detector and two-step amplifier having a list price of \$1,000 and not so long ago either! An audio frequency amplifying transformer could be purchased for no less than \$20 or thereabouts.)

mplifying transformer could be purchased for no less than \$20 or thereabouts.)

The thought of radio frequency amplification brought much skepticism, and for a long time no one ventured to do much along this line. Suitable inter-stage coupling transformers were lacking.

Today there are more than 200 legitimate.

Today there are more than 200 legitimate pes of receivers, all of which constitute an adaptation of about five fundamental cir-

THE FIRST RADIO FREQUENCY

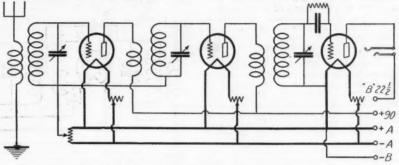
The first radio frequency receiver with its e-stage of untuned radio and non-regenerathe detector gave enough trouble. Some signals were good, others terrible. And to add regeneration to the detector was akin to tempting the wrath and ire of a lion. Someone, applying Pupin's principle, concived the idea of tuning the radio frequency applifier, and from then on progress has

been made in utilizing tuned radio frequency amplification in receiving sets. But again-just as the signal would be brought to maxinum intensity, very objectionable howling and squealing would begin.

Venturing forth again, after having applied the audio frequency amplifier to the

Fig. 1 shows the familiar Hartley oscillator used to a large extent in the transmission of continuous wave signals. With a slight modification we can recognize it as the splendid Reinartz circuit, so efficient in the reception of C.W. signals.

An oscillating receiver is not necessary



The familiar potentiometer or "losser" method which is also known as tube character-variation, was one of the first steps used by experimenters in controlling oscillations.

circuit, two stages of tuned radio frequency were added, and one can imagine what happened to those persevering pioneers. Their lot was by far much worse than one can be-lieve, for radio engineering was undreamt of and each followed his own line of procedure. But more and more the slide rule and sound electrical engineering principles

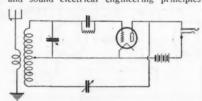


Fig 1. A powerful generator of oscillations over a wide band of frequencies, the Hartley oscillator has found great favor with the transmitting amateur.

were applied to solve the great amount of work standing before those ambitious ex-perimenters, and more and more it was found that by following rigidly well-known electrical rules those of radio well-nigh agreed. Men who worked haphazardly found that they could get nowhere, and only by thorough reasoning was the present stage of development reached.

for broadcast reception (except in the special case of the Super-Heterodyne), and thus such a type of set is used only on the short waves from 200 down to 75 meters and less where radiation from it does not interfere with broadcast reception.

OSCILLATION

In broadcast reception, maximum amplification with any tube is reached just below its oscillating point. Obviously, the ques-tion immediately arises, why use a circuit which causes the tubes to oscillate? This logical question is readily answered when it is stated that it would be impracticable to build such a set because it would be impossible to obtain sharp and selective tuning. For best results both the grid and plate circuits must be tuned and this lead to the grid and plate circuits must be tuned and this lead to the grid and plate circuits must be tuned and this lead to the grid and plate circuits must be tuned and this lead to the grid and plate circuits must be tuned and this lead to the grid and plate circuits must be tuned and this lead to the grid and plate circuits must be tuned and this lead to the grid and plate circuits must be tuned and this lead to the grid and plate circuits must be tuned and this lead to the grid and plate circuits must be tuned and this lead to the grid and plate circuits must be tuned and plate circuits must be tuned and the grid and plate circuits must be tuned and plate circuits and the grid and plate circuits must be tuned and plate circuits and circuits and circuits and c cuits must be tuned and this leads to a condition where oscillation is bound to occur, unless special arrangements are used.

There are several various methods used to keep the tubes from oscillating. Each affects to some degree the sensitivity of the results are good. Everyone knows that the introduction of resistance into an oscillating circuit will do two things. It will cause broad tuning and, more important, will result in poor signal strength. Of course, the resistance will prevent undesirable oscil'ation, but the cost in inferior results is far too great.

In a radio frequency receiver there are precisely two causes for oscillation, one that of inter-tube coupling due to the inherent capacity between elements of the tube, and the other due to inter-stage transformer coupling, both of which are of great concern. Let us see what has been done to bring

about a condition of stability and control, a condition where quiet operation is an out-standing feature not to be overlooked in the performance of a set.

Along with the first attempts at controlling Along with the first attempts at controlling the oscillating point in a receiver, the potentiometer found ready application. It was soon learned that if the grid return was connected to the negative side of the "A" battery for the radio frequency amplifier units, the tube was placed in a much better position as a straight radio frequency ampli-

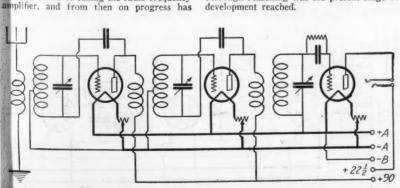
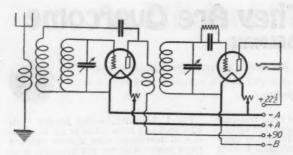


Fig. 3. The method invented by Rice. As can be noted, it is similar to a bridge arrangement, in which the capacity inherent in the tube is counterbalanced by the neutralizing condenser.



fier because of its inherent characteristics.

However, strong oscillation was the result

of a too negative grid bias, while poor amplification was the result of a too positive grid bias. The potentiometer afforded a ready means of adapting the grids of radio

frequency amplifier tubes to the varying circuit conditions incident to wave-length change while tuning. These incident changes are variations in "B" battery potential, differences among tubes and radio frequency transformers and other minor changes in either circuit or apparatus. Although this either circuit or apparatus. Although this method of controlling oscillations is a very good one, its main disadvantages are that it

good one, its main disadvantages are that it constitutes an added control, results in somewhat broad tuning and slightly decreased signal intensity. This is due to the increase in the current taken by the grid when the potentiometer makes it positive. For this reason, it has often been termed a "losser."

Fig. 3 shows the Rice method of neutralization wherein the filament terminal of the tube is connected to a point which divides the inductance of the secondary circuit into two nearly equal parts. This places the mid-point of the coil always at zero potential, Fig. 6. An adaptation of the Rice method which employs a tertiary coil wound along side the secondary and whose magnetic field is in opposition to the latter.
Although this scheme is applicable to several stages of Although this scheme is ap-plicable to several stages of amplification, it is rather inefficient on account of in-troducing too much absorp-tion, with consequent loss in signal strength.

one side and the neutralizing condenser and secondary of the transformer as the other The ratio of the two capacities is the

and resistance in series, while the other side is formed by the internal capacity and re sistance between grid and plate of the tube These are to be regarded as in series. The values are not critical generally and depend upon the characteristics of the tubes.

A very effective method for preventing oscillations is to provide a means for damping them. This is accomplished by placing a closed circuit composed either of induc tance alone, or a combination of inductano and capacity, in close proximity to the tune circuits. These auxiliary circuits act as ab sorption circuits, tending to absorb energ from the tuned circuits. This has the sam effect as if resistance were added to the tuned circuits which prevents oscillating. The tuning, however, is not as broad as would result from the introduction of resistant

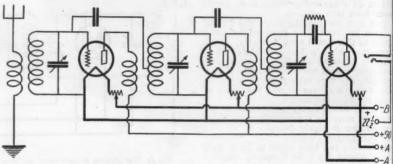


Fig. 4. The Hazeltine circuit. Another bridge balance method which gives good results when the radio frequency transformers are properly disposed.

same as the ratio of the two inductances, that is, the inductances of the primary and secondary coils. In some cases only part of the secondary coil is used in neutralizing. directly into the tuned circuits.

Fig. 5A.)
Fig. 6 shows an adaptation of the Rice method, in which, instead of tapping a conear or at the middle, the coil is built in two sections, which are in inductive relation to one another. The coils are so disposed that the magnetic fields are in opposition.

Fig. 7 shows an adaptation of the Hazeltine circuit, excepting that, instead of using the secondary of the transformer secondary for neutralizing, another coil is introduced into the magnetic field of the transformer.

REVERSED FEED-BACK

Fig. 8 shows the Superdyne method, which is also known as the reversed feed-back method. In this circuit an e.m.f. is intro-duced into the grid circuit by coupling a coil to it which carries the plate current. The polarity of the "tickler" is made such that the e.m.f induced in the grid circuit i in phase opposition to the incoming signal potentials impressed on the grid. At the same time, the coupling transformers tuned. The amplification decreases as the coupling between the grid and tickler collis made closer, but as it is loosened the am plification increases up to the condition permitting self-oscillation. This negative feed-back may be made to occur in any one

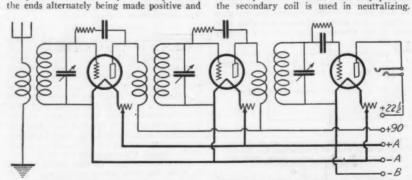


Fig. 5. Farrand, employing still another modification of the bridge balance method, evolved the above. The system can be used for a number of stages and proves quite effective.

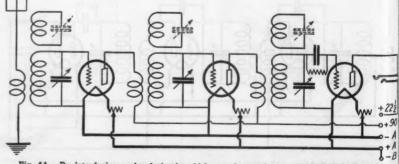
negative, respectively, by the high frequency potentials impressed on the grid. One end of this coil is connected to the grid of the tube, while the other is connected through a small capacity to the plate of the same

It is readily seen that this forms a Wheatstone Bridge arrangement which neutralizes the effect of the tube capacity. The capacity of this condenser, if the two parts of the coil have equal inductance, should be equal to the inter-electrode capacity of the tube. Using the 201A or 301A tubes, this should be about 10 to 15 mmfs. This prevents the feed-back of energy through the tube capacity, and permits the use of tuned circuits for inter-stage coupling without having self-oscillation courts. self-oscillation occur.

NEUTRALIZATION

It will be noted that in this circuit the neutralization takes place on the grid side of the tube; the Hazeltine circuit, in Fig. 4, does the neutralizing on the plate side. The bridge arrangement can be seen to include the grid filament capacity and the primary of the coupling transformer as This is done for convenience in obtaining

neutralization, but is not always necessary.
In the Farrand method, shown in Fig. 5, we have also a bridge arrangement, but this time there are no inductances involved. One side of the bridge is formed by a condenser



g. 5A. By introducing a closed circuit, which may be tuned or untuned, in inductive relation to the radio frequency transformers, its damping effect readily controls any tendency toward oscillation.

side d re-tube

The

and

Rice co

11. aze

tro

en

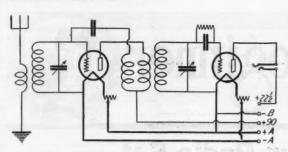


Fig. 7. Left: Showing the use of a bucking coil in the plate circuit, whose magnetic field is in opposition to the plate inductance. This is a variation of the Hazeltion showing a plate resistance in the first stage, the Superdyne method in the second, and a grid resistance introduced into a regenerative detector circuit, preceded by two stages of tuned radio frequency. This arrangement is but one of the many possible circuits using the known methods of overcoming oscillation.

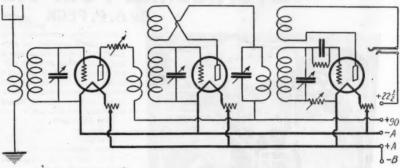
while others will stand comment as an exceptionally fine example of quantity production. Of course, it is readily understood that the manufacturer's main consideration is the building of a receiver which, primarily, shall be of advanced design and work well under all conditions. It is his problem to evolve a method of producing large quantities of re-ceivers which shall cost him as little as possible and be able to sell at a reasonable price. The public is not interested in his troubles and are not desirous of knowing the intricacies involved in the manufacture of the set. What they want is something good at a price within their means.

stage of amplification, or may be accom-plished by coupling the plate circuit of the detector tube to the grid circuit of the first R.F. amplifier.

There are other methods by which selfoscillation can be controlled or prevented, but they are all further adaptations of the methods that have been explained above. Furthermore, several of these methods can be incorporated into one receiver, using one method for one stage of amplification and another method for another stage. This gives rise to many circuits known as "plexes" and "dynes," which generally bewilder the radio student, but contribute very little to the radio art.

It might be interesting to note in passing that the tendency in receiver design is the use of a minimum of controls. Whether the successful single control receiver will make its appearance in the near future or whether the nearest approach to it, in the shape of a two control set, will supplant it, is at this time hard to conjecture.

The manufacturer has realized the poten-tial possibilities in the use of the experi-



mental laboratory as an aid, not only to himself, but to the art of radio as well. More and more, extensive research work is being undertaken and the inevitable result is the large succession of so many circuits that put in an appearance. In some of these, there are meritorious points which are commendable from an engineering point of view,

Undoubtedly, those who are carefully watching the market are noticing the falling off of the inferior class of sets. The better off of the inferior class of sets. The better grade of receiver holds a dominating position which it is bound to maintain in the future. As Coue might say, "Every day in every way, our radio sets are getting better and better."

American Scientists Strive for Radio Perfection

EEP dved-in-the-wool scientists are now taking a serious interest in the many phases of radio transmission and reception, and may evolve standards for methods, frequencies and measurements which will aid broadcasting and benefit the denizens of radioland, here and abroad.

The American Section of the International Union of Scientific Radio Telegraphy at a recent meeting in Washington, reported on many problems on which research is under-A resumé of the session by Dr. J. H. Dellinger of the Bureau of Standards states in part as follows:

There is a great increase of interest in radio measurements because so many people, have gone into all phases of radio design and engineering, have found it essential to secure real measurements. The accurate measurement of radio frequencies, has attained in-ternational importance and popular as well as scientific interest because the reduction of interference in radio reception depends upon The vast increase in the use of radio necessitates the operation of transmitting sta-tions as close together in frequency as pos-A practical limit to such crowding is the accuracy of maintenance of station frequencies. The work of numerous investigators is providing means to give the necessary precision of measurement, constancy of adjustment, and absolute accuracy of frequency basis. International comparisons of frequency standards have shown a very satisfactory agreement. One of the interesting means of making such comparisons is the piezoelectric oscillator, a new device which is contributing greatly to current progress, especially in the use of very high frequencies or short waves. The piezoelectric oscillator

is essentially a piece of crystalline quartz. Methods and apparatus have been worked out to use such a device to control the frequency of a radio transmitting station, thus giving constant frequency stations.

"There is increasing use of apparatus for

measuring the field intensity of radio waves; a number of methods, some of them rapid and convenient, are being used extensively by investigators."

Dr. L. W. Austin stated that measurements show the average intensity of signals from European and California stations has been somewhat less during 1924 than in 1923. The variations of the intensity of received signals from the high-power station at Bordeaux, France, have been found to be the same in France and in the United States, whereas no such correspondence in the received signals is found for measurements in the two countries on the transmitted waves from the high-power station at Rocky Point, Long Island. Measurements of the strength signals from European stations show a drop in signal strength just after sunset in Europe. Observations of signals from highpower stations over greater distances than have been hitherto attempted, as for exam-ple, from Java to California, show that the low frequency stations transmitted to greater distances than hitherto indicated. Measurefrequencies above 3,000 kilocycles indicate that the fading of such signals is greater, and the reliability of transmission less, at distances under 500 miles than at greater distances. In the winter frequencies above 5,000 kilocycles are observed to be transmitted much better in the daytime than at night, the reverse of conditions with lower frequencies.

Dr. A. H. Taylor reported that the Committee on "Variations of Radio Wave Direchad found that a shift of the apparent direction of the waves from long wave stations occurs at sunset. The direction shifts toward the east before sunset, returns to normal at sunset, and then usually shifts to the west. The exact cause of this has not yet been fully determined. Some variations of direction in broadcast station trans-missions have been found at night. At very high frequencies the changes of direction are very rapid and very great, so that direction measurements are quite impossible.

tion measurements are quite impossible.

Measurements of atmospheric disturbances produced in low frequency receiving circuits during the last three years indicate that their intensity was greatest in 1922 and least in 1923. Observations of atmospheric disturbances indicate that their direction often corresponds accurate that their direction often corresponds accurately to the position of external responds accurately to the position of storm and cloud areas over the country. At fre-quencies of more than 3,000 kilocycles atmospheric disturbances are comparatively mild in the daytime, but at night in the summer-

m the daytine, but at high in the sainties time they are worse.

Mr. E. F. W. Alexanderson, in presenting the report of the Committee on "Measurement of Interfering Radiation," said that a portable direct-reading instrument for field strength measurements has been developed, which would make it possible to determine the precise amount of interference not only on the main wave of a station, but in the side bands and harmonics. The use of a standardized direct-reading instrument of this kind will make it possible to obtain actual statistical data on interference produced by various radio stations and other sources.



Overhauling Your Radio Set

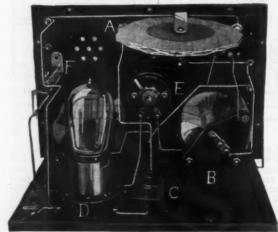


Fig. 3. A typical single tube radio receiving set with all the essential parts lettered for reference.

HE spring of the year seems to be universally set aside for the cleaning and overhauling of all appliances "Spring necessary to human welfare. is a well-known by-word to the housewife. Every spring the careful auto-mobile driver either spends his Sundays in completely cleaning or overhauling the car, or else drives it to his favorite garage to have this work done. And so it should be with every radio set owner. During the long winter evenings, when "DX" reception During the at its best, the radio set operator seldom, if ever, thinks of looking over his set unless something goes radically wrong with it so that reception becomes impossible. Thus, in order to keep up a receiving set at its highest efficiency, and to avoid annoying trouble just at a time when the set is most desired, a certain time of the year must be set aside for going over the set completely.

In order to satisfactorily carry through the overhauling of a receiving set, a definite system must be followed. The object of this article is to point out the various steps in the overhauling of an average receiving set. You will find that practically everything contained herein will pertain at least in part to your particular type of set, regardless of its style. Owners of crystal detector receiving sets will take care of their various coils and variable condensers in exactly the same manner as is described for vacuum tube sets. In the last part of this article will be found a few notes for the especial benefit of those using crystal detector receiving sets, either in ordinary crystal circuits or in a reflex circuit using vacuum tubes in combination with the crystal detector.

It is a very good idea to determine beforehand just when you are going to start overhauling your set. It is best to contemplate spending at least a day in this work and, after deciding upon the time, see that you have the following materials on hand. With these at your command, you can proceed quickly and systematically with the cleaning and overhauling and you will not have to stop to procure other materials during the process. Beside your regular radio tools and soldering materials you will need:

Fine sandpaper.
A fine file.
Shellac.

Thin lubricating oil. . Two or three strips of cloth free from lint.

A soft, clean varnish brush, one inch wide.

Several pipe cleaners.
A generous stick of sealing wax.
A strip of flannel.

A battery voltmeter. THE ANTENNA

The logical place to start in with the overhauling of a radio set is at the antenna

and ground. The antenna is the long wire located either outdoors or within the house, which, in turn, is connected by means of another wire to the radio receiving set, and the whole of which serves to pick up the radio waves sent out by various broadcast stations. When an aerial is suspended indoors and away from sudden atmospheric changes, as well as rain and snow, there is very seldom any trouble with it unless the wire connecting the antenna itself with the receiving set becomes broken. In such a case, it must be mended by soldering the two ends together after thoroughly scraping them. For complete instructions on soldering, refer to the article by the writer which appeared in the March issue of Radio News.

With the outside antenna, however, the troubles are slightly different. Here corrosion will often take place, due to the action of the elements on the wire. The corrosion is particularly noticeable at the joints, that is, where the antenna and lead-in are connected. This joint should, of course, always

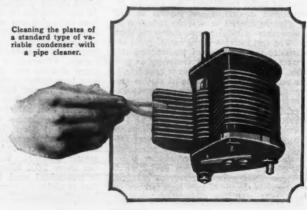
be soldered, but even such an event there is often sufficient corrosion to prevent good connection between the antenna and the leadin wires. Such can readily be determined by inspection. Lower the antenna to the ground and look over the joints thoroughly. You may find small cracks in the solder, an evidence of corrosion. In such a case, unsolder the joint, scrape both of the wires thoroughly and resolder.

Much has been written in various publications regarding the effect of corrosion on the antenna wire, aside from the joints, upon transmission and reception. It will, however, be found, in the case of broadcast reception, that even a quite badly corroded antenna wire will give excellent results, provided the connection between the antenna and lead-in is firmly soldered and electrically perfect. In transmitting sets, particularly of low power and those operating on a short wavelength, corrosion of this nature has a detrimental effect, but as far as the broadcast listener is concerned, it may be completely disregarded. Therefore, after you have made sure that all the joints on your antenna are perfect, you may entirely forget about the corrosion on the rest of the wire.

Now that you have a perfectly soldered joint, it is a good idea at this time to guard against further corrosion. An excellent method of accomplishing this is illustrated in Fig. 1. Wrap several layers of friction tape over the joint, continuing the wrapping for an inch or so on either side of the twisted parts of the wires. Draw the tape tightly so that is will adhere firmly to the wire. Then paint this tape covering with shellac, being sure that all of the tape, as well as a short length of wire on either side of the covered portion, is completely covered by the liquid. The aerial can then be immediately hoisted into place, allowing the shellac to dry after the antenna is in position.



Fig. 1. The above illustration shows how to protect a soldered joint from corrosion by the use of several layers of friction tape coated with shellac.



THE AERIAL SWITCH

If your lead-in is provided with an aerial switch so that the antenna may be connected to the ground when not used for reception, this switch should be looked after. It is probably located out in the open and, therefore, quite subject to corrosion. Clean the blade and jaws with fine sandpaper so that they make a good contact. Unless the wires connected to the switch are soldered in lugs which, in turn, are clamped under screws, remove the wires, polish them thoroughly with fine sandpaper and replace, tightening the machine screws as much as possible.

If a lightning arrester is used, be sure that here also the connections are clean and tight. If that type of arrester is employed, which is equipped with a spring clip for fastening the connections, remove the wires, clean them and insert them in the clips after bending the latter out a little so as to restore the spring of the metal and so as to insure firm contact. If the wires are held to the arrester by machine screws and nuts, clean as before and tighten the nuts thoroughly.

All of these precautions are taken so as to be sure that the current set up in the antenna by the radio waves will reach the receiving set with as much strength as possible. Now, that this has been accomplished, we must provide a satisfactory return connection.

That is, the ground connection must be carefully and thoroughly made or otherwise all of the time spent in working on the antenna will bring small results. The average radio receiving set is grounded to a water pipe or to a length of iron pipe driven into the ground and the wire is connected thereto by means of a ground clamp. Here is another point where corrosion may take place, particularly if the connection is exposed to the outside atmosphere. If the ground clamp is badly corroded, replace it with a new one after thoroughly cleaning the pipe at the point where the connection is made. Here you can also prevent future corrosion to a very great extent by the use of tape and shelfac. Cover the entire ground clamp, an inch or so of the wire connected to it and an inch of the pipe on either side of the clamp with tape, leaving no openings for the entrance of air to the clamp and pipe. Then apply a coat of shellac and allow it to dry. The effect of the tape and shellac is to prevent dampness and atmospheric moisture from reaching the from reaching the metals and so corroding them at the point of contact.

Before we leave the subject of collective agencies, as antennae or aerials are sometimes termed, let us note in passing the loop antenna. An ordinary type is illustrated in Fig. 2 and the two flexible wires which connect this piece of apparatus to the re-

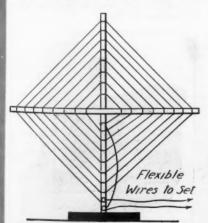


Fig. 2. Above: Indicating the flexible wires leading from a loop antenna to a receiving set which are liable to break in use. Fig. 5. Right: A cartridge type grid leak, the care of which is described in the text.

ceiving set are shown. As the loop is turned, these flexible wires are twisted, and through continued use will sometimes break. Often the wires under the coverings break, but the open point is not noticeable because the insulation remains intact. Such an event would be denoted by a sudden cessation of reception or at least a greatly reduced volume. In such a case, install new flexible wires. Even though there is no trouble as yet with these flexible wires, but if the insulation is badly worn and twisted, install a new pair anyway. This will guard against future trouble.

against future trouble.

After you have finished your complete inspection of the antenna and ground systems, you will be ready to start on the

will be ready to start on the receiving set itself. The first thing to do is to disconnect all wires from the receiving set, including the antenna, ground, all batteries and phones or loud speaker. Better remove all wires from the batteries also, so that the loose ends will not short circuit. Place the batteries to one side until they are ready for their share of attention. Do the same with the loud speaker or phones and then remove the receiving set from the cabinet. You will then be ready to completely inspect the various component parts of the set under the best conditions. Here you will find that a flashlight will come in handy for getting a closer view of the various parts that may happen to be hidden by other instruments. A flashlight may often disclose a loose or broken connection or a defective instrument which would otherwise pass unnoticed.

We show in Fig. 3 a rear view of a typical radio receiving set with the various parts that will bear inspection and overhauling. If careful attention is paid to every point outlined below, you may replace the set in the cabinet with perfect assurance that it is ready for another season of good results. The various points indicated in Fig. 3 are

The various points indicated in Fig. 3 are as follows: A indicates the inductance coil, which may be any one of many various types. B is a variable condenser. Practically all of them are of a type similar to this one and will be taken care of in the same manner. C indicates a combined grid condenser and variable grid leak. This instrument is completely sealed in and usually needs no attention whatsoever, unless it has been used so often that the resistance unit is worn away. In such a case, it will be necessary to replace the leak with a new one. D indicates the vacuum tube socket in this receiving set, while E is the rheostat and F an open circuit jack.

and F an open circuit jack.

We will now deal with the care of the various instruments in detail. Consider all types of inductance coils, an example of which is indicated by A, in Fig. 3. Dust collecting on the surfaces of coils has a detrimental effect which cannot be overlooked. This may be quickly and easily removed if a soft, clean varnish brush about one inch wide is used. Simply brush the dust off the surface of the coil, carefully working into all crevices and corners. This

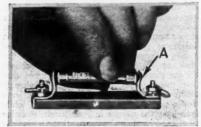




Fig. 10. Using a tooth brush and alcohol for cleaning the surface of a crystal.



Fig. 7. The pencil points to a bent contact spring on the vacuum tube socket.

applies to all types of coils, either of the low loss type or those wound on cylindrical tubes. In any event, remove all dust.

The condenser next comes in for its share of attention. Dust often collects between the plates of the condenser and thus forms a partial connection between the various plates with the result that the operating efficiency of the receiving set is lowered. This point would seem to be a very hard one to get at, but if you will take an ordinary pipe cleaner and bend it into a loop, as shown in Fig. 4, you will be able to run it in and out between the plates of the condenser and so remove every trace of dust and dirt therein. Treat all of the variable condensers in your receiving set in this manner, being careful to get in between each and every plate.

The variable type of grid leak was mentioned above. If, however, you use one of the tubular types, such as illustrated in Fig. 5, it is well to remove the cartridge from the clips, bend the latter together slightly and, with fine sandpaper, brighten, the tips of the cartridge so that they will make good contact with the springs. Then replace the

leak in the clips.

Now we will turn to the vacuum tube socket. All the remarks below will pertain to each and every socket in the receiving set, regardless of the number. Each one should receive the same careful attention. A standard socket is shown at D, in Fig. 3, and another one in Fig. 6. In the latter, we have removed the socket from the set so that the parts of it can be more plainly seen. Note the flat springs pointed to by the pencil in the photo. Often these springs become weakened, due to continued pressure, and do not make perfect contact with the prongs of the tube. In such an event, you can reach one finger inside the tube socket and bend up the ends of the springs so that their life is restored and so that they will firmly press against the prongs on the base of the tube. These prongs are indicated by the pencil in Fig. 7. They should be noticed also and if they are at all dull or corroded, scrape them lightly with fine sandpaper or a file so that they are bright. Then when

frayed or broken. If it is, install a new

one. Also, with a pair of pliers, tighten the nuts on the backs of the receivers, as indi-

cated by A, in Fig. 9. If the tips enter the casing of the receiver, tighten up the set-screws with a screwdriver while you have the cap and diaphragm off the receiver

Before you put your radio set into opera-tion, and even before you connect the bat-teries to it, test these latter with a volt-meter. Undoubtedly the "A" battery, re-gardless of its type, has received careful

attention, as a drop in voltage here is quickly noticeable. However, the "B" batteries are often neglected. If you use dry "B" batteries, test each unit separately. If a 22½-volt unit has dropped to less than 19 volts, replace it. In the case of a 45-volt unit, 39

give satisfactory results. Storage "B" batteries require constant attention just the same as "A" batteries and have undoubtedly

volts is about the lowest at which



you replace the tube in the socket you may be sure that perfect contact will be made

be sure that perfect contact will be made between the prongs and the springs and no losses will occur at this point.

We will now consider the rheostat indicated by E, in Fig. 3. You may have noticed occasionally in the operation of your set that the filament seems to flicker occasionally and at the same time music is affected. This may frequently be due to a loose contact arm on the rheostat, which should be immediately remedied. So, in your overhauling, look at these arms and move them back and forth several times in order to see whether there is any looseness. If the arm does not seem to be making perfect contact with the wire wound on the sector, remove the arm, bend it down slightly and replace. It should then make perfect contact. With carbon-pile rheostats you will seldom, if ever, find any trouble. Just brush off the outside of the container so that no dust collects thereon, forming a leakage path, and further attention will be unneces-

The jack, indicated by F, will give a little trouble if dust is allowed to accumulate in any great quantity on the short insulating strips which separate the spring or springs from the frame. The varnish brush men-tioned above will remove any dust found

here

After you have completed the cleaning of all the instruments, bring a soft cloth into play to dust off the panel, the baseboard and all the crevices around them. You will not be able to get it all out with a cloth, but do the best you can. Then take the stick of sealing wax mentioned above, rub it briskly with the piece of flannel cloth until it is thoroughly electrified and run the end of the wax along the various cracks and crevices where the cloth could not reach. The wax, being electrified, will attract fine particles of lint and dust to it that cannot be removed by any other process and the result will be a very clean set. This method of removing foreign material can also be ap-



Fig. 8. Above left: A well soldered joint. Above right: A joint which, while soldered, is not very strong and should be resoldered.

plied to other points on the receiving set where a cloth or brush cannot be used. Next, look over the connections of the You may find one or more connections

made as indicated in Fig. 8. Such a type is very bad and is liable to cause trouble, as it may break when least expected. In such an event, get out your soldering iron and make the connection so that it appears as shown in Fig. 8. over the wiring, take each broken connections by this method and they may be quickly and easily repaired.

This completes all of the overhauling work necessary on the set itself. The loud speaker will seldom, if ever, need overhaul-

Such a connection is as nearly electrically perfect as it is possible to make one. After you have gone and every wire between your fingers and tug it slightly at any place where it is connected to other wires. You will quickly locate any loose and

been cared for regularly. Therefore, in your overhauling, just give these batteries their usual care. TO CRYSTAL USERS

Below we give a few points which will be of interest to those who use crystal rebe of interest to those who use crystal reciving sets or who are employing crystal detectors in reflex receivers. It may be that recently the signals have started to get dim or the set does not seem to work as well as it formerly did. If the overhauling of the set as described above does not seem to bring back satisfactory results, remove the crystal from its clarme or the and serial the crystal from its clamp or cup and scrub the crystal from its clamp or cup and scrub
the surface carefully with alcohol, taking
care not to touch that surface with the
fingers. A small brush, as indicated in Fig.
10, will greatly assist in this cleaning
process. While you have the crystal out
of the cup, clean the end of the contact
which touches the surface of the crystal.
A fine file or sandpaper will accomplish this
very nicely, and will provide a clean contact for the freshly cleaned crystal.

Just because your radio receiving sel

Just because your radio receiving sel happens to be functioning quite properly at the present moment, do not think that it may not need overhauling. If it has been in use for a period of six months or so, it is undoubtedly ready for a complete overhauling and the time to do it is before something goes wrong. So now set aside your day for the spring cleaning of your radio set and be assured that you will never regret the time spent in this work.

Furthermore, you will be able to enjoy summer reception with a minimum of noise in the set itself. Static alone is bad enough and you should take every precaution to preset noises from annoying you. hauling the instruments as described above

will accomplish this.

The Experimenter

has come back! If you are one of the one hundred thousand readers of the old ELECTRICAL EXPERIMENTER, you will no doubt be glad to hear that the EXPERIMENTER has come back BIGGER AND BETTER THAN EVER.

Experimental Radio

Nothing but experiments, written by the foremost radio authorities, also a monthly editorial by H. Gernsback. A fine roto-gravure section to brighten up the magazine. But best of all for you radio readers, is the big radio section of over twelve pages of some fifty radio experimental articles—and mind you, NOTHING BUT EXPERIMENTS.

LIST OF INTERESTING ARTICLES TO APPEAR IN THE MAY ISSUE OF THE EXPERIMENTER

Electrical transmission of pictures Laboratory reproduction of a famous soda

Measuring the Voltaic cell.

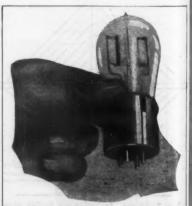
Experiments with Tesla resonator.

By Kenneth M. Swezey. Fun with Spark Coil. By Esten Moen. Fun with Spark Colo.
Paper Disc Loud Speaker.
By James Farnworth.

Be sure to reserve a copy from your news-dealer before the issue is sold out.

THE EXPERIMENTER will be on sale at all newsstands April 20, 1925.

ing, as most of them are completely enclosed and so are not subject to the action of dust and weather conditions. If, however, you have a radio receiving set which employs headphones, these will need some attention. If you will look through the small hole in the center of the cap you will un-doubtedly notice a small rusty spot inside. Removing the cap, you will find that this rusty spot is on a thin disk of soft iron. You can remove this disk, but take great care not to bend it. Remove the rust with fine sandpaper and place a drop of very thin oil on the metal and spread it out. Then wipe the disk off carefully, still taking care not to bend it; and replace in the phones in not to bend it, and replace in the phones in the same position as it was removed. In other words, have the same side of the diaphragm, as this disk is called, on the inside as was in that position before the cap was removed. Do the same with the disk, or diaphragm, in the other receiver. If the diaphragms are so badly rusted that the metal seems to have been weakened, address the manufacturers of your receivers for a new nair of diaphragms. Also, while for a new pair of diaphragms. Also, while you have the phones in your hands, examine the cord and make sure that it is not



Showing the prongs or contact pins of base of a standard vacuum tube such as in radio receiving sets.



HOUGH the first real thrill to an inventor comes when he or she finds that the new invention really works, the second and greatest thrill is felt when others are convinced that it works and are "sold" on it. I believe that anyone who has been through these first two thrill stages has a fair idea of what the inventor's reward is.

But the reward of public approval and acclamation, though perhaps the one that warms the inventor's heart the most, is not actually the one of most importance. An invention that wins the confidence and recognition of the public nearly always brings reward in another way also, and this may not necessarily be money.

I am fortunate enough to have submitted two new inventions in the radio field that have brought to me two handsome silver cups, and no matter what the financial value may prove to be if the articles find a real place in radio, my big thrill came with the news of winning the cups.

These cups, both of striking beauty, were awarded by the judges of the new inventions sections of the First Radio World's Fair, held at Madison Square Garden, New York City, and at the Second Annual Chicago Radio Show, held at the Coliseum in Chicago.

PORTABLE AERIAL

The first was awarded for a portable antenna for its "uniqueness and compactness and the fact that it can be used indoors, outdoors and for portable use, such as on automobile trips or camping parties." This, substantially, was the statement of the judges in making the award. I might almost call this a pocket aerial, because, unless you are afraid of tearing your vest pocket, you might almost squeeze this antenna into it. It looks and works like a surveyor's tape, contains 100 feet of copper ribbon, has spring action which allows the ribbon, when strung up, to withstand even the worst gale, is insulated at both ends and can be locked in position at any distance up to the 100 feet of the ribbon's length. It was my idea to invent something in an aerial that would prevent kinking and tangling and reduce the number of operations in erection that are now required. The judges who awarded me the cup were kind enough to say that my idea has been realized.

The second cup, which I won two months after the first, at Chicago, was awarded for a combined amplifier and loud speaker. This invention makes possible loud speaker reception in conjunction with a one-tube set. On a base about six inches square there is the mechanism for two stages of audio frequency. The loud speaker, which is a part of the whole, is a top made of wood and shaped like a metronome, the little instrument that used to beat time for us on the top of the piano when we were children. Its acoustics were found to be exceptional because of bridges similar to those used on a violin. These bridges, four of them, separate a stem coming down through the center of the speaker from the top, and the sides of the shell itself. The speaker unit fits into the end of the stem.

It is interesting to know that the two inventions were successful, yet perhaps one of the reasons they were successful was because the industry is so young. This illustrates what can be done in a new industry, and especially one of the scope and importance of radio. Probably in a few years my little contributions to the science may seem like nothing in the face of what is bound to develop and they may even be obsolete by that time. One might even wonder then why they were called inventions at all and were not listed simply as developments in radio that were a natural consequence rather than a direct creative effort. I emphasize this to illustrate just what a tremendous opportunity is offered by radio in the inventive science and how the real breadth of the field yet remains to be tapped before new ideas are exhausted in radio appliances.

appliances.

Radio took a grip on me from the first. Perhaps that accounts for how and why I happened to design something new. I am giving this answer here because that is the question my friends ask me most often. They want to know how I, a young woman with a family and a home to care for, could find time or show the interest in radio that was required in the completion of my two inventions.

THE IDEAS

They were the development of natural ideas at first, the idea for the antenna coming to me when I saw so many people on the roof of our apartment house having all kinds

of trouble trying to erect them from coiled wire and the like. They couldn't avoid getting it all tangled and the insulation necessary seemed to be a great source of trouble. And, in addition, if they had too much wire or tape for the distance available, they were forced to cut the copper and thus waste some of it, in case they wanted to use it again. That planted the seed in my mind for the idea, but I really didn't begin to carry it toward fruition until one roof climber got his wire so badly twisted that he gave the whole thing up as a bad job and hurled his antenna material into the ash can. I was convinced then that an aerial could be devised that would be easier to handle and, give better results than the one then reposing in the ash can where its possibilities of giving even bad reception were badly handicapped.

The completion of the combined amplifier-loud speaker idea came after I had learned that no one-tube set had the power to give loud speaker reception and that an owner of such a set was doomed to sit for life wearing earphones 'tlamped to his head unless he got a more powerful set. The amplifier-loud speaker gives the power necessary to amplify the reception from the one-tube set and the loud speaker itself is attached, making one article do where two were required before.

From being an "amateur" listener at first, I graduated into that class of fan which liked and accepted the listening, but whose members wanted to go farther and delve into the intricacies behind the listening and learn why certain causes resulted from certain effects and why the whole field of radio couldn't be entered into by anyone through experimentation.

I make no claims at being an expert set builder, nor am I willing to undergo an examination that even an amateur might give me. I read the radio magazines eagerly, and a new circuit always interests and intrigues me, but I still think that the field is so new and there is so much to be learned and the whole science is progressing so fast that very few can keep pace with it. I explain all this to make clear that I am making no claims as an authority on the subject, but am just one of the millions of fans who are helping to establish the new science,

(Continued on page 2116)



A NEW phone for radio receiving sets is so small that it is worn in the operator's ear. The actual size of these instruments can be gauged by comparing the phones shown in Fig. 2 with the child's hand holding one of them. The permanent magnet is of horseshoe shape, and fitted outside the phone case proper. The magnet is bent so as to help hold the phone in position when in the ear.

are commercially practicable.

The magnet coils are contained in a very small metal case; each set of phones has a resistance of 3,200 ohms. The phone ends are in a small metal nozzle fitted with a celluloid ring at the end; this ring holds the phone

securely when inserted into the ear. The weight of each is only half an ounce.

As the diaphragm is very light and small,

As the diaphragm is very light and small, the phones give clear and pure reproductions of broadcasting. It can be adjusted by means of a small milled ring over the coil case. A locking ring then fixes the position of the adjusting ring.

Two phones, together with a long flexible cable are contained in a small leather pouch measuring but 3½x2 inches. The case is small enough to be placed in a vest pocket.

For portable sets, the new miniature phones should be a great advantage, as they require next to no space. Ladies will also welcome them, for they need no longer fear that their hair will be disarranged when wearing the new phones.

wearing the new phones.

For secret radio, such phones are indispensable; with their aid, a detective, for instance, will be able to carry an "invisible" set on his person. One phone only would be used, and the other ear left free.

For a secret radio set for police, a small one-tube set, together with a coil antenna, is worn while on dury; the cable leading from the ear to the set would be flesh-colored and so defy casual inspection.

Through the set, reports from headquarters would reach the officer without any loss of time, and he could be informed of the latest happenings, or of changes in plans made, without having to return to headquarters.

COURT UPHOLDS RADIO REGULATIONS

A FEDERAL Judge of Tennesse fined an unlicensed amateur radio operator for illegal operation of a radio transmitter with malicious intent. Although the fine was light, compared with the maximum penalty, \$500 or a year's imprisonment, it is believed by officials of the radio section of the Department of Commerce that this case will serve as a warning to others who try to obtain their "fun" by spoiling the pleasure of regular radio fans.

Radio Supervisor Deiler had been receiving numerous complaints from Knoxville radio fans, that someone was jamming the atmosphere regularly when broadcast pro-

grams were on the air. One public-spirited citizen offered a reward of \$100 to anyone who discovered the owner of the offensive transmitter. Another fan located the illegal set, reported it to inspector J. N. du. Treil, who called on the alleged amateur. He found him operating a spark coil transmitter and without receiving equipment. Later he filed a complaint with the U. S. Attorney, to the effect that Section 1, of the Act of August 13, 1912, regarding the illegal use of a radio transmitter to create willful interference was violated. The culprit confessed that he operated the set solely to interfere with the broadcast reception of a neighbor, and the case went to court, resulting in the imposition of the fine.

This case is an example, cited to show that radio laws and regulations are rigidly enforced throughout the country in an effort to keep the air channels clear for all kinds of radio traffic including broadcast reception. Listeners and amateurs should report all violations of the radio laws and regulations, co-operating with the Department of Commerce.

PT



The comparison between the small earphone and the hand holding it in the above photograph will give a very clear idea of the actual size of this new device for radio.



The method of wearing the miniature earphones is plainly shown in the above photo. The advantage for listeners of the fairer sex is at once obvious.

Television for Amateurs By S. R. WINTERS

Here is a preliminary report of a new and simple device which makes the transmission of sketches possible to amateurs.



THE army of approximately 20,000 radio amateurs may be on the threshold of a new and fruitful period of experimentation. Radio vision—the sending and receiving of photographs, sketches, script, maps and autographed letters—is now in its infancy, just as radio telegraphy was 20 years ago. This revolutionary system of the transmission and reception of distant scenes by radio has been proven sound in principle; it remains now for the real experimenters to translate the laboratory achievement into practical performance.

THE INVENTOR

C. Francis Jenkins, inventor of the motion-picture projecting machine and credited with many other far-reaching discoveries, has not only developed a system for the sending and receiving of pictures and sketches by radio, but has demonstrated its value in performance tests in the laboratory and afield. Very recently he has invented and built a small and simple machine that will put radio vision within the reach of the radio amateur. It marks the introduction of a practical realization of what Mr. Jenkins prefers to call a service to the eye, just as radio now is a convice to the eye.

service to the ear.

The machine built for use by radio amateurs is inexpensive and, when compared with its marvelous accomplishment, is very simple in construction. This unit may be connected to a small electric motor or victrola as a governor control, which engages with a gear as a means of driving a shaft. On each end of this shaft a brass cylinder is mounted. A second threaded shaft engages with the cylinder shaft through a pair of gears. Mounted on this threaded shaft is a pair of arms connected together with an insulated bakelite bar. The rotation of this threaded shaft moves the bar of bakelite longitudinally with respect to the cylinders. Furthermore, mounted on this insulated bar are two contact fingers, one coming in touch with the cylinder used for sending photographic impressions and the other makes contact with the cylinder employed in receiving the maps, sketches, pictures, etc.

TRANSMISSION

The message, whether taking the form of a business letter or a sketch to represent a radio diagram, is written with a pen on white paper. The ink used in making this impression is peculiarly adapted to this purpose, having been invented by Mr. Jenkins. This strip of paper containing writing to be sent by radio is wrapped around one of the

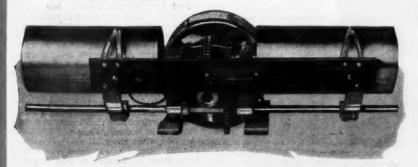
brass cylinders and secured thereto with a fragment of sticky paper. A switch is closed in an electric circuit which connects the cylinder at the contact finger with the transmitting machine. Whenever a line of writing passes under this contact finger a radio wave is propagated into space just as the closing of a telegraph key sends forth an electric impulse. At all the receiving stations of this photo-letter system of communication the incoming radio signals pass through the contact finger on the receiving cylinder and make a chemical mark on the paper. That is to say, every time a line of writing at the sending station passes under the contact finger a mark is made on every receiving station cylinder.

Mr. Jenkins told the members of the Third National Radio Conference that he would not ask for any special allocation of wavelengths for the transmission and reception of pictures and photographic copies of messages, letters, sketches, etc., by radio. This means that radio amateurs in their experimental efforts in the field of radio vision may further investigate the possibilities of short wave-lengths or high frequencies. Therefore, when the President of the American Radio Relay League speaks optimistically of the potential value of short wave-lengths he may also include in the picture the prospects of radio vision within these once idle and worthless bands of frequencies. Mr. Maxim states: "This new territory, of unplumbed possibilities, and a great and farreaching achievement of the radio art is rapidly gathering headway as these thousands of experimenters take up and solve the problems they encounter on these short

The including of a Jenkins' duplex photogram machine, so called, in the radio equipment of the amateur station means that when these pioneers in wireless development tire of exchanging telegraphic code with friends in Australia that they can switch to the picture-sending unit and show the Australian amateurs, at long range, scenes of the objects about them. These photographic impressions may take the form of a pencil-writing greeting, a sketch of the antenna system at his station, a map of the section in which he lives, or a picture of the transmitter that he uses. Irrespective of the subject thus treated, there will be an irresistible fascination in this unbroken ground of experimentation.

IN USE

This so-called service to the eye, to quote



Another form of the device employs a small motor for turning over the cylinders which carry the "pens" and the chemically treated paper.



A phonograph may be used to synchronize the copying devices at the two stations.

Mr. Jenkins, in introducing the system to the United States Post Office Department, is "a method of transmitting messages by radio instead of by steamship, Washington to Panama in five minutes. It has the authentic character of an autographed letter and the speed of radio. It is the beginning of a radio service to the eye, where heretofore radio has been an address to the ear only. Will the time soon come when the Post Office Department will deliver by radio photographic copies of our business letters at the speed of light, rather than the relatively laggard delivery of the originals by mail plane? Such an exchange of intelligence would wonderfully speed up industry because, like an army, industry can go no faster than its means of communication."

Fitting, is it not, that Mr. Jenkins, whose mechanical ingenuity conceived the beginning of the billion-dollar-a-year motion picture industry, should also invent the practical machine that ushers in radio vision to the 20,000 amateur radio stations? He has been experimenting along the line of picture projection for more than 300 American and foreign patents—ranging from spiral liquid containers to self-starting devices for automobiles. He foreshadows a time when radio vision will make it possible for us to view the Olympic games in Europe, and people of other nations will be enabled to see at long range the inaugural ceremonies of a President of the United States. The placing of duplex photogram machines in the hands of radio amateurs is a step in that direction. It means a thorough exploitation of the abstract idea of seeing as well as hearing by radio.

The action of the apparatus is the simplest possible. The picture to be transmitted is drawn on paper with a copper sulphate solution in such a way that when the needle passes over the written lines the chemical ink transmits an impulse through the cylinder and needle, which is, in turn, sent into the radio transmitter.

At the receiver, an amplifier is used after the detector, and the amplified impulses sent out by the transmitter are passed to the receiving pen and cylinder. A paper moistened with potassium iodide or ferrocyanide is placed on the receiving cylinder. When the amplified current passes through the needle the electrolytic effect discolors the paper, giving perfect reproduction of the original picture.

THE "PENS" ARE SIMPLE CONTACT POINTS

The beauty of this system is, of course, its simplicity. The victrolas at the two stations may be exactly synchronized by adjusting their governors. The cost of the two-cylinder arrangement is small; in fact, it may even be constructed by the amateur. The motor method is likewise simple.

This little arrangement bids fair to open up a whole new field to the amateur experimenter.



Hamitorial A League of Notions

N OW here is another one. Within the last two years, the Hams have done themselves noble in the matter of international communication, and have also just about worn the Q sigs threadbare in their conversation with gents who use a different slang from their own and eat soup for break-

A timely suggestion, it seems, is for us to exhume the League of Nations notion so lately and firmly interred at Washington, D. C. There are several research.

suggestion.

First of all, what does a guy do when he gets into communication with an F (Frenchman) or somebody or other? He gets his call, a check and then transfers congratulations as best he can through the agency of the Qs. That finished, the only thing left is to pass a 73 on and go tell the gang about what he has done.

Now, as far as the good of the race is concerned, what a waste of good time and plate juice. Further, what is the tie that binds all the amateurs of the world together? Certainly, after a Ham has logged a few of the Fs and Gs, the thrill begins to pale, and then when he busts the antenna meter making him hear you, and succeeds two or three times, the thrill and feeling of brotherhood again loses a bit of its old-time kick.

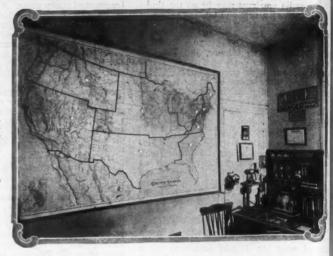
Therefore, me bucks, I submit the follow-

ing to the executive committee and ask your closest co-operation so that you may thoroughly understand the deep, underlying principles of international law and common sense which is the foundation of this, our

fraternity, etc., ad infinitum.

The point is this. Since the matter of interocean and international radio among the Hams is a matter of not far distant future, it seems logical to suggest some international organization to immediately step in and take charge of such matters as may need their

The present A.R.R.L. is in an advantage-ous position to start such a movement. There is lots of interest in the other countries and Station 2 F Z.
Bronx, New York.
Note large map,
divided into the
nine radio districts, each section having miniature lamps which
light, giving pleasing effect.



there is lots of information in each of them that the Hams of other nations would find of great account if they could get to them. why not start a little of the old pep on the road toward such an organization?

Among other things, the condition of the Among other things, the condition of the amateurs in other countries is not so high-falutin as in our own. A few hints from us and a little advice now and then might do a lot to help them and, incidentally, to help ourselves.

But, with the exception of the G stations alone, there is the barrier of language which has to be overcome before any such arrange-ment can be brought about. Now here is where the little suggestion comes into play.

Of course, the magazines could print a dictionary of technical terms in all languages, including the Scandinavian, and let the Hams 'bone" nights learning to spell the mess, but it seems to me that there is a much better and more logical method easy at hand.

When the old Q sigs were first opened to the eyes of the struggling bugs, in the days when the old closed core and rotary were the stuff, an operator could tell the other fellow just about what he had in the

way of equipment and almost what he was working on without ever using anything but the new abbreviations. Now it's different. There are a thousand and one things about the tube outfit with designation by inter-

national agreement at all.

With a well-designed set of code letters and words, it would be possible to carry on intelligible conversation between all the nationalities of the earth without infringing on any language.

much This step is much easier to take than would appear at the first glance. together a few of the old-timers who have had wide experience

pounding the brass, getting the traffic of the hook and cleaning the rectifier plates Set 'em around a table, place a tentative list before them and let them chew the rag over it for a few hours. The result will be a few broken heads, more busted feelings and a darn good list of abbreviations

The only trouble here is that some enter-

prising brother may conceive the idea of erecting a new international language to vit with the dozen or two fightnig for the chies spot at present. But the old-timers, methinks, can care for this particular genus with ease and alacrity. Hi.

Then when a tentative American list is finished and has received the hisses and adulation of the gang, the next step would be to pass it over to some of the boys abroad There are lots of the Big Boys who know a co-worker or two on the other side who could be depended upon to pass the good word along. A little explanation and a wait of six months or so until they had time to digest the idea and add a few of their own ideas to it.

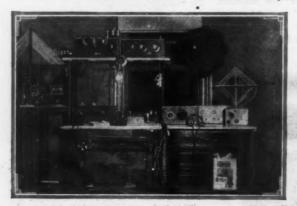
Now, with matters taken this far, it would comparatively simple to carry on the business of getting together, through the use of a little expert knowledge in the other languages and the addition of a few more abbreviations. Then a few interocean meetabbreviations. Then a few interoceatings could be held via the old C.W.

And here let me sling a few random ophecies. Now the matter of making conprophecies. tact with the foreign fellows is getting to be almost a daily occurrence. A few more trials and some improvements on the present style and arrangements will bring the thing to be a nightly affair instead of a weekly one

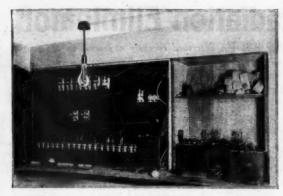
Within a year or so at the outside there Within a year or so at the outside there will be one or two paths carrying traffic to Europe—and maybe S. A.—as they are now carrying traffic nightly from the 2s to 5 and 7s. This may seem pretty much, but it's not. Wait until the time comes and see.

And when it comes, there will have to be something done about all the previous sufficients. Recause when you start a relations.

Because, when you start a relay from Paris or London to San Francisco you've got to have just as definite arrange-ments for the traffic routing as you do now



9BUI at St. Louis, Mo. On the top shelf can be seen a long wave set, immediately below it a short wave receiver, and to the right a regular B. C. L. outfit.



Showing a storage "B" battery installation which serves the purpose of furnishing plate supply to the transmitting tubes, much better results being obtained than when using a motor-generator.

when handling it from coast to coast of the United States.

Then, when the time comes, there will have to be an organization to make the arrangements spoken of above. Now this is one way of doing it with the least possible trouble and taking advantage of the factors and organizations already established. It is no self-respecting bunch of hams of any country who have not their own national society. These societies can begin to get together through the same old C.W. mentioned above. Then they can form a loose but definite organization among themselves to take care of suggestion, international arrangements, etc. The big point here, of course, is that they should, as soon as possible, get accustomed to doing business with each other so that should some emergency, or a sudden desire to grab some publicity or a little help, arise in some one of the countries, a communication to the other leagues will not create such a surprise.

A few preliminaries, such as appointing somebody as a sort of corresponding secretary and someone else as a president to sign the secretary's messages, is a matter that could be easily taken care of. Then, after the temporary organization was completed, each of the national leagues could appoint a delegate in any way they see fit and the delegates could carry on their business of organization entirely through the medium of the aforesaid C.W., therefore beating the railroads, the steamship companies and the Pullman porters out of some good jack! MIM.

elns

of vie ief

ne-

ad

ait

the the ner

et-

nto

ng ne to

Then, after all this has been done and relay circuits arranged to all civilized countries, including the Scandinavian the grand climax could be put on the air in the form of a sort of international convention open to all and pretty much within the reach of all. That is, within the reach of all who could rig up enough radio frequency on the short-wave receivers.

By a system of relays, using the aforementioned abbreviations, it would be entirely possible for the Ham in New Zealand to have an almost constant contact with the European gents.

International Ham radio is just in the offing. So the gang might as well begin to think along some of the lines hinted at here. The best way to solve any problem is to meet it before it arises. After it comes up, of course, there are always details that were forgotten in the carefully laid plans; nevertheless, the greater part of the work is done and the details are not so important.

So why not get in a few letters about it and give a few ideas of your own? Everyone should have a crack at it so that the best possible solution will be the one finally selected to serve.

And another word as to the abbreviations. They are needed almost immediately, if a sensible transfer of technical knowledge

through the air is to be possible. Any body can read a diagram or a hook-up since they are written in almost the same way the world over. But when it comes to giving the constants of condensers and coils, it's a different matter. Here some method of abbreviation is necessary.

Come on, gang, do your stuff.

—Jay Hollander.
[The first International Amateur Radio Conference took place in France early this month (April)—indeed a great step forward in "making ends meet." Mr. Lloyd Jacquet was sent as a representative from the United States. — Editor.

Hams Asked to Help Government

A GAIN it's the amateur who is in the fore. Realizing the potential possibilities of the "Ham," the Government is slowly but steadily giving him more leeway and cooperation, and now that short wave experiments are under way, special schedules of transmission are being formulated; the Army and Navy are both vieing with each other in getting "on the right side" of the OMs, and it is safe to say that the near future will witness some wonderful improvements in the short waves.

Recent high frequency, or short wave, transmission tests from the Naval radio laboratory at Bellevue, D. C., have proven so successful over long distances that one of these transmitters is now being used regularly each night as part of the Washington

Within three months it is hoped that seven or eight of the Naval District Communication Centers can be equipped with small high frequency receiving sets for practical and training purposes. In the interest of developing amateurs into prospective Naval Reserve radio operators, the Department of Commerce has been asked to prepare data and instruction on short wave communication for distribution.

The Navy is greatly interested in having a broad study of high frequency, low power communication conducted and urges that amateurs picking up NKF, Bellevue, on 81.5 and 54.3 meters Monday, Wednesday and Friday nights, communicate with Bellevue. The Bellevue set used for official communication, operating on 71.5 meters, transmits between 500 and 1,000 words each night

to San Diego and Balboa. It has been so successful that these stations have been permitted to "unguard," that is, not listen in for the Annapolis are set

mitted to "unguard," that is, not listen in for the Annapolis arc set.

This set at NKF is operated by a radio relay from the Navy Yard at Washington, where a 50-watt, 30-meter set is controlled by wire from Naval radio central in the Navy building. The oscillations of the transmitter are controlled by a special crystal at the desired frequency. The only antenna is an ordinary galvanized iron pipe about 35 feet long and 2½ inches in diameter located on the laboratory roof. There are no masts or wires so familiar in high-power work. Compared to most Naval radio stations, the power used in this work is very low, being between 8 and 10 k.w., whereas Annapolis is 350 k.w.

Signals from Bellevue's short wave transmitter have been copied in Australia, and were picked up by the U. S. S. Canopis while 7,330 miles distant. The battleships Tennessee, Utah and Wyoming, and the U. S. S. Patoka also have reported long distance, short wave reception.

Operators at the Balboa station built themselves a home-made set, while the operators on the Canopis constructed a single circuit, regenerative tuner, which functions well at very long ranges. This last set included a detector tube and one step of amplification. Low loss basket-weave coils of fixed value, having 11 turns each, three inches in diameter, were used. VT-1 tubes were used without grid leaks. The coils were mounted on a wooden frame so as to facilitate sharp tuning, and an air-type, 11-plate, continuously variable condenser was employed. The set at Balboa has also received Polduh, England.

Steps are being taken by the Navy to install experimental short wave receivers in the Philippines and Hawaii, while extensive studies in this work are planned during the fleet maneuvers in the Pacific.

New QRA's

3IW-H. A. Robinson, Silver Lake Farm, Willow Grove, Pa. All rpts. appreciated and crds QSL'ed.

9BZX—(Re-assigned) Isadore J. Rocklin, 3227 Jennings St., Sioux City, Iowa. 5 Watts CW. All crds QSL'ed. Pse correct your call book. TNX.

9CTV-Clement Pack, 131 Broad St., Menasha, Wis. Pse QSL crd. All crds answered same day.

9DCY-P. C. Biedenharn, 1914 Garrard St., Covington, Ky. 5 Watts CW, ICW es Fone.

(Continued on page 2118)

Exhibit of one of the members of New York City Radio Club, at the recent Show and Convention held at the Hotel Pennsylvania, depicting the amateur's work and progress.

SPARK SET USED IN 1920 Cuts of Marketer Continuous Wave Traising The Amateur's Work and Progress.



The essential parts of the radiation eliminator.

PVERY broadcast listener and amateur has a pet grievance, but the one grievance that leads all the rest is radiation from regenerative sets improperly tuned. How many times we have been listening to the golden notes of a singer or to the mellow music of a violin, only to have some too enthusiastic neighbor try for a DX station and thereby make the night hideous with a wild collection of the well known squeals and howls that would do credit to a close debate occurring at the local zoo.

There are many receiving sets on the market today that do not radiate, but for every one in use—well, we just cannot even guess how many sets there are that yell, shout and scream. The average set that is built in the home work-shop has a tendency to radiate badly. It would be almost an impossibility to give the reasons for this, as they are different on nearly every set that is built.

However, to combat this great disadvantage of radio reception a vast amount of research work has been performed. For many years nearly every large research laboratory and a number of amateur experimenters have been seeking a device to prevent a set from broadcasting the above mentioned nuisances. One of the first steps forward in 1925 was the announcement by a large radio corporation of such a device that has been eagerly awaited for a long

The only extra apparatus that is necessary to entirely eliminate radiation from a set is a choke coil and a small condenser placed in the circuit, as shown in the accompanying diagram. Also it will be noted that the antenna connection, instead of going to the usual place for this type of circuit, is connected at the point C to the grid of the audio frequency amplifier tube. The choke coil A is placed in series with the phones and plate circuit of the audio frequency tube. The condenser B connects the plate of the audio frequency tube to the grid of the detector tube. The remainder of the circuit follows the usual practice.

The operation of the revised circuit is that the received signal is impressed upon the grid of the audio frequency tube instead of the grid of the detector tube. The audio frequency tube acts as a radio frequency amplifier with the result that radio frequency variations are set up in the plate current of this tube. The insertion of the choke coil A results in the development of radio frequency potentials, which are impressed on the grid of the regenerative tube through the small condenser B. Due to the fact that this condenser has a very small value and the capacity between the grid and plate of the audio frequency is very small when the regenerative tube oscillates, a negligible amount of radio frequency current goes out of the antenna with the result that no disturbance is produced on neighboring antennae. The overall result on the received signal is a material increase in selectivity and there is in general no loss whatsoever in

A New Radiation Eliminator

The radiation eliminator herein described recently appeared on the market and should stop unnecessary radiations.

efficiency. When storage battery tubes are used there is in many cases an increase in efficiency.

The function of the choke coil being to develop a potential over a considerable range of wave-length, it is made in several sections having natural periods of 300 and 400 meters. The more sections that are used, the more uniformly will the efficiency be maintained over the range of broadcast wave-lengths.

The accompanying illustration shows the size of the device as compared to the hand of the ordinary man. The device is so simple that almost anyone can install it in a few moments with the aid of a few bits of wire and the ordinary household tools.

From the foregoing it will be seen that the necessary apparatus for preventing radiation is very easy to connect to any existing circuit. Several times in the past tew months there have been agitations started to eliminate from the air sets that radiate and so are an annoyance to listeners in the vicinity. That this apparatus has been perfected is at once a step forward in the right direction for the ultimate good of all concerned.

HOW MANY BROADCASTERS DO WE WANT?

THE question of how many broadcast staor, rather, how many can the Department of Commerce accommodate?—has become most pertinent.

The department has just issued a list showing the wave-length distribution for the existing 78 Class B private broadcast stations of the country, excepting nine on the Pacific Coast. For these 78 stations there are 47 separate channels; six of them are split three ways, 20 are divided between two stations and the 21 others are assigned exclusively.

How long a station can hold an exclusive wave-length is another question, for there are 21 more projected Class B stations said to be under construction or planned, and the nine Pacific Coast stations to be taken care of.

The Commerce Department has announced

that this list includes all the waves there are for the Class B's to use; literally, "there isn't any more" wave space. Secretary Hoover is without authority to deny a station a license if it meets operating requirements. He will hesitate, therefore, to tell an applicant he cannot have a license, although he might be justified in many instances in doing so.

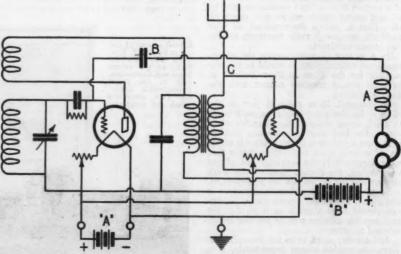
Reviewing the situation in some of the congested localities, it is soon seen that the broadcasting field is not only well covered, but is jammed. In New York there are eight B stations, including one in Newark, on the air using six wave-lengths; how can any more be licensed? Yet there are several other applicants.

WEAF, WJZ, WNYC and WHN have exclusive wave-lengths, which might be shared with four new-comers, but would this plan interest the radio public? Most of these stations are quite popular and one is a municipal station, whereas the new-comers represent unknown quantities.

The situation in the Chicago district is perhaps worse. There are 10 stations there sharing five wave-lengths—an even split. But there are several well-known companies and concerns waiting to open Class B stations, it is understood. Philadelphia has four large stations and two wave-lengths. Fortunately, the congestion is not as bad elsewhere.

How Mr. Hoover's aides will decide the question is not known. It may revert to the public in the form of a sort of referendum, when the actual applications from these 20 odd stations come in. If so, Mr. Hoover may ask the prospective broadcasters and the radio fans what to do.

Should nationally popular stations like WEAF or WJZ be forced to share their wave-channels, dividing time with unknown and unestablished stations? Will a station operated by Messrs. Blank & Co., in New York, give reliable and entertaining service of benefit to the radio world, or as much so as the two stations mentioned as examples? Would it not be better to license new stations in the crowded districts like New York as Class A stations, sharing their wave-channels with several other distant stations in other radio districts?



Circuit diagram showing where the instruments for eliminating radiation are placed.

Push-Pull Amplifiers with Standard Parts

By PHILIP K. WINSLOW

The efficiency of the push-pull amplifier in point of perfect tone reproduction has long been known. Here is a method of building it which uses only standard parts which every experimenter owns.

ECAUSE the push-pull audio frequency amplifier has seemed to require two special transformers, many radio fans have been deterred from adopting it by the extra cost involved.

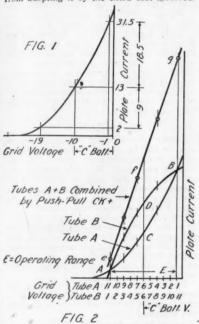


Fig. 1 shows the familiar characteristic curve of the average tube. Fig. 2 shows push-pull combination effect.

Here is a method of construction which requires only one transformer and that of the standard two-winding type. The results will be equally satisfactory.

Before going into details of how to con-

asked, "Why build a push-pull at all?"

To answer clearly that sensible question, let us go a little into the fundamentals of amplifier design. In the earlier stages of an amplifier, it is not necessary for a tube to give out much energy because the apparatus it feeds (the inter-stage transformer and the grid of the next tube) requires very little energy. However, as the stages increase, more and more power is required.

From the standpoint of power output alone, the two tubes might be connected in parallel, but having them in the so-called "push-pull" circuit clears up a certain kind of distortion and so this circuit is always

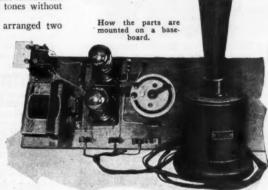
used. A study of the familiar vacuum-tube characteristic curve, as shown in Fig. 1, will explain this. Suppose a 10-volt negative will explain this. Suppose a 10-volt negative "C" battery is used, and that the incoming signal superimposed a maximum of nine volts, alternately + or -, on the steady C voltage of the grid. The actual grid voltage then swings from - 1 to - 19 volts, and the plate current rises and falls also. But the latter is not proportional to the former the latter is not proportional to the former because the tube's response falls off at the lower end, i. e., the characteristic is curved. This curvature, while most pronounced at the lower end, really exists throughout the working range. One of its effects is to "heterodyne" two strong audio notes, producing a "beat" note which is sometimes heard as a high-pitched buzz, but more often spoils the clarity of the other tones without spoils the clarity of the other tones without attracting attention to itself.

Suppose, however, that we arranged two tubes in a circuit so that while the grid voltage of one was decreasing that of other was increasing. Then, by putting the plate currents through a transformer so as to reverse the effect of one tube, we could make the two outputs add up. Doing this graphically in Fig. 2, where ACB is the curve of one tube and ADB that of the other (with direction reversed in the out-put transformer), EFG is the resultant current, and line is evidently much

straighter than either of the original lines. Hence the heterodyning of one audio note with another will be much less than with either tube alone or with the tubes in parallel.

The usual way of arranging tubes in pushpull is shown in Fig. 3. All the elements of this diagram are familiar to radio fans, and need no explanation except the symbols "I" and "O." These stand for "inside" and "outside," respectively, and identify coil ends that have the same polarity at any instant. To connect coils in series, we connect an I to an O, just as we connect a + terminal of one battery to a — terminal of another battery. When a direct current flows into such a junction point, as where the "B" battery connects to the output transformer, half of it flows through the upper coil, cre ating a magnetizing force acting upward, and the other half flows through the lower coil, creating a magnetizing force acting downward. When a signal comes in from downward.

the previous stage, it generates an alternating voltage in the secondary of the input transformer acting at a given instant in the direction of the nearby arrows. Now measuring the grid-filament voltages, this new voltage will tend to reduce the effect of the battery on the upper tube and increase it on the lower tube. So the plate current through the upper tube and its coil is increased, giving an increased upward mag-netizing force in the core of the output netizing coil. At the same time the plate current in the lower tube and coil is reduced, giving a reduced downward magnetizing force. The latter has the same effect as the former-to increase the magnetism in an upward direction. A moment later, with the reversal of



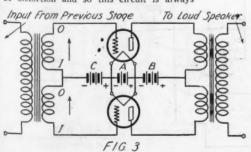
the incoming wave, the whole action is reversed, and both tubes act to increase the magnetism downward. This alternation of magnetism induces a voltage in the output secondary which sends current through the loud speaker.

For some reason, probably the slight increase of cost, manufacturers seldom put out transformers with coils in sections, Some pains are needed to make the two sections equal, and probably the demand does not justify it. There are on the market only two or three makes of transformers with which to construct this circuit, and an output transformer must be used to combine the outputs of the two tubes. To avoid To avoid this, it is only necessary to secure two essentials: (1) A mid-point for the grid returnwire at the input side, and (2) a mid-point for the "B" battery at the output side.

(Continued on page 2179

Input From Grid Leaks & Meg

Loud Speaker Previous Stage 111 1111 Connection Between Coils Diophragm F1G. 4

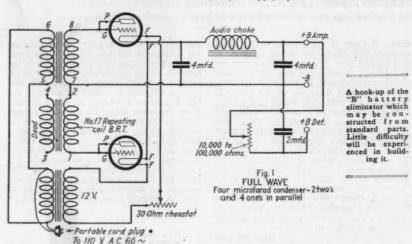


Left: The ordinary 2 tube push-pull am-pliner. Right: New method giving excel-lent results.

B" Battery Eliminator from Standard Parts

By DONALD E. LEARNED

Here is a rectifier for supplying "B" current that anyone can construct.



PROBABLY the greatest nuisance connected with the operation of nected with the operation of a radio set is the battery supply. "A" batteries lose is the battery supply. "A" batteries lose their kick and the set no longer amplifies as it should. "B" batteries run down and develop high resistance cells, so that they cause howls, weak signals and loss of distant reception. Storage "B" batteries are some improvement, but they must be charged occasionally. Dry batteries are very expensive from the viewpoint of current cost, about two hundred times as expensive as commercial current

However, to utilize commercial current, it is necessary to smooth it out, make certain voltage reductions, and highly desirable to interpose some sort of insulating device between it and the set. Devices which do the above operations are already on the market under various trade names, but the item of first cost makes many radio fans hesitate to invest.

These devices are not complicated, but the construction of them presents quite a few problems if the necessary transformer is built at home. However, a little shopping at the radio stores and at the second-hand telephone supply houses, will land the apparatus needed and an evening's work will complete the assembly.

Obtain from a telephone supply house a high impedance repeating coil and 5 twomicrofarad condensers (10 one-mfd. condensers will do). The coil obtained should be wound with wire, 30-gauge or larger, and should have four separate windings of approximately equal resistance, any one of which should have sufficient impedance to use as the primary winding on 110-volt 60cycle current. This coil should be tested as to insulation between windings at 220 volts 60 cycles by connecting one end of each winding to either side of the test voltage. The condensers should also be tested on the same voltage.

CHOKE COIL

An audio choke coil will also be needed to act as a filter to cut out the hum of the supply current. This may be a telephone choke or retardation coil, the secondary of an audio transformer, or the primary of a bell-ringer transformer. Providing the unused winding is not short circuited, all windings may be left in place on the core.

In addition to the above apparatus, the following is also needed: 1 6- or 12-volt bell ringing transformer

(must handle ½ or ¼ amp., respectively). 6- or 30-ohm rheostat for 6- or 12-volt

respectively.

Tube sockets

1/4-amp. amplifying tubes. Variable resistance, 10,000 to 100,000 ohms. 10-ft. portable cord and plug to connect

to house circuit.

3 Binding posts, —B, +B Det., + Amp. 1 Box, panel and base, 7 x 12 inches in size; or one 7 x 12-inch mounting board.

Mount the apparatus in the cabinet, or on the mounting board, as preferred. The condensers may be stacked to conserve space, and fastened down by passing a leather strap over them, and securing the strap to the base with screws and washers.

Wire as shown in Fig. 1, windings 1-2 and 7-8 being connected to assist each other. The winding numbers are standard with most coils. Connect the portable cord to the primary of the bell ringing transformer and to either 3 and 4 or 5 and 6 of the repeat-ing coil. Wire the filament circuit according to Fig. 1 for a 12-volt supply and according to Fig. 2 for a 6-volt supply.

ANOTHER FORM

Fig. 2 is given for the utilization of a telephone retardation coil, or a transformer of ratio 1:1 up to 1:1 ½. While this gives only half wave rectification, it will operate very quietly if the filter system (choke and condenser bank) is good. Specifications for the retardation coil are the same as for the repeating coil except that it has but two windings

A word as to the operation of these plate current supply devices. It sometimes hap-pens that the user connects one to a set that pens that the user connects one to a set that has insufficient negative bias on the tubes causing quite an audible hum, due to overload. This is hard on tubes as well as the user's ears. This outfit will supply sufficient plate current for eight tubes, if they are properly biased. Add "C" battery to the country of the plate it before to eye down on the point where it begins to cut down on the signal on the audio stages, and on the radio stages if they are non-oscillating. The writer applied a 12-volt bias to the radi stage of his set, with a reduction from 20 milliamperes to 5 milliamperes in plate current and increase of signals. This conserves the life of the tubes as well.

CONTROL

Control of the output voltage of the s may be had by adjusting the rheostat, at of the detector voltage by means of the a justable resistance. And this last is a re-control, too. Also keep in mind that thoutput voltage is from 155 volts on down depending on the load. Do not turn the tubes high on a one- or two-tube set.

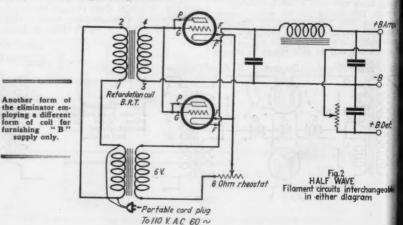
Old tubes will sometimes work very nicely in this outfit, but be sure to check then

with a good tube, for a paralyzed tube ma be so far gone that it will not pass enoug current to keep the condensers charged. For an eight-tube set, nothing but the best should

The writer will be glad to receive an comments on the above device, and will be glad to advise further on receipt of stampe self-addressed envelope.

SPECIFICATIONS WRITER'S OUTFIT

The writer used a Kellogg No. 17A r peating coil, No. 40A retardation coil filter choke, a Dongan 6-8-14 bell ringit transformer, Kellogg No. 34 condense (2 mfd. paper) and a Durham adjustab resistance. Output voltage on a four-tul set, 135 volts, computed by milliammeter at counter emf. method, detector voltage var able from 45 volts to 6 volts calculated b substitution method. Voltmeters are not reliable unless checked with a milliammet as they consume a very appreciable propo tion of the output current, thus lowering t voltage. The writer also recommends use of VT-2 or 202 tubes in conjunction w an Acme 75-watt filament transformer extreme load conditions.



S .

th tw

that that the the cient are the

The adio n 20 curerves

e set and e ad real t the lown in the

nice them may lough For hould

any ill be mped

er fo

80

8 Det.

geal

S XI

PAGE (S

S) MISSING

Awards of the \$50 Radio Wrinkle Contest

First Prize
A LOW LOSS SPIDER-WEB COIL
WINDER

By H. A. MACDONALD

There are many different methods of preparing coil forms, the majority of them requiring holes drilled around the circumference of the disk. The form here described eliminate all such drilling and also pegs that wear and get loose in their sockets. The materials necessary are a side of a cigar box (straight grained), a 3/8-inch piece of hard wood from which the disks may be cut, a piece of strip copper about 1/2 inch thick, and a 1/4-inch stove bolt. A fret or scroll saw is necessary to cut the slots.

plat es, er-

ent

lio

dio

eal

wn.

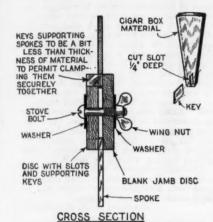
em

1gh

uld

ub

and



Showing how the various parts of the coil winder are assembled.

Cut from the cigar box material 13 spokes, as shown in the accompanying sketch, clamp them together and even them off with sandpaper, making them all the same shape. While the spokes are clamped together, mark off a center line (at the edges of the spokes which are clamped between the disks or the inside ends nearest the center) and saw a slot ½ inch deep. This slot acts as a support and centralizer for the spokes, which slip into the key carried on one face of the disk, as described later. The slot permits the spokes to be slid off after the coil has been wound.



The final assembly of the winder is a simple matter, as shown above.

Next cut two disks from the ¾-inch material and divide one of them into 13 equal parts on the outer circumference and draw lines to the center. A second circle is drawn ¼ inch nearer the center, which acts as a guide for the depth of the slots carrying the keys. These slots are sawed also with the scroll saw. The keys are cut from the thin sheet copper and fitted to the slots, the width being a little less than the thickness of the spokes. If these keys are exactly the width of the spokes when the disks are clamped together, it will be impossible to remove the spokes after the coil is wound. These keys are glued in the slots on one disk only, the other disk acting merely as a backing to clamp against. A ¼-inch hole is drilled through the two disks to take the stove bolt, which may have a wing nut to tighten with.

stove bolt, which may have a wing nut to tighten with.

Slide the spokes on the keys and place the blank disk in position, clamping with the wing nut and stove bolt, using washers as shown. After winding coil, paint the intersections of windings with collodion and allow to dry about 15 minutes before removing from the form. The resulting coil will be one having as few losses as possible and in addition once made the form may be used indefinitely with no appreciable wear.

size of the recording dial, 9% inches. Drill out both centers Place panels together and drill screw holes in each corner, for fastening the panels together. Using the drilled hole as a center, cut a hole in the panel the size of the dial (which we will assume to be three inches) so that the dial will revolve freely in it. If the panel is of any great thickness, bevel it so that the indicating point will come near the graduations on the dial. Then cut the openings through which the call letters and the station name appear, these also being beveled.



A recording log such as this is a good looking and convenient adjunct to the set.

Before assembling, four cardboard washers are prepared so that the cardboard may turn freely between the two panels. This cardboard log is pivoted on the sub-panel by means of a split-rivet or similar means. After the two panels have been fastened together by small bolts and nuts (or in case cardboard is used, paper clamps), make sure that the recording dial and hole are concentric. Spread glue thinly upon the back of the dial and set it firmly upon the recording log. Allow the glue to dry thoroughly. The face of the panel may be finished in any way that the constructor may desire.

Third Prize HOME-MADE DIAL INDICATOR

By JAMES A. MALONEY

The majority of the dial markers that are on sets today have one great disadvantage, which is that if the markings on the dial are viewed from an angle, an error of as much as one division may be made. With

Prize Winners First Prize \$25

A LOW LOSS SPIDER-WEB COIL WINDER

By H. A. MACDONALD Care of J. E. Sirrine & Co., Greenville, S. C.

Second Prize \$15 A NEW RADIO LOG

By HERBERT C. McKAY, Eustis, Fla.

Third Prize \$10 HOME-MADE DIAL INDICATOR

By JAMES A. MALONEY, 524 Crown Ave., Scranton, Pa.

Note: The next list of prize winners will be published in the July issue.

Second Prize A NEW RADIO LOG

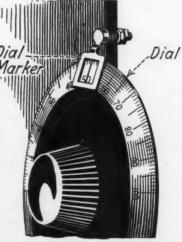
By HERBERT C. McKAY

A radio log such as is illustrated in the accompanying photograph will appeal to the large number of fans who have sets that may be logged. It is comparatively simple to construct and should prove of great aid to any receiving equipment.

construct and should prove of great aid to any receiving equipment.

The panel may be of any stiff material. For the best appearance a thin radio panel may be used, or for ease of construction a good grade of black cardboard. A subpanel is also necessary, which may be of binders board, or stiff cardboard about ½ inch thick. These two panels should be 8 x 10 inches. The log itself is made of heavy white bristol board and is 9½ inches in diameter. Four cardboard washers and a 3- or 4-inch dial constitute the remaining material. The memo, pad may be purchased at a stationery store for a few cents and cut down to required size.

The two panels are cut exactly to size. On the face of the sub-panel and on the back of the panel describe a circle exactly the



Dial indicator made from switch point and sheet brass.

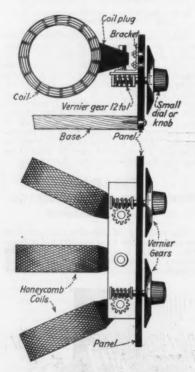
the marker described, this error is eliminated, as the marker is almost touching the dial.

From a piece of the inch metal, file out the marker shown in the sketch. The shaft is inch long and as wide as the switch point, to which it is soldered. The opening through which the dial markings are seen is $\frac{1}{4} \times \frac{3}{6}$ inch, with $\frac{1}{16}$ inch frame. The shaft is bent so that the marker is at the same angle as the beveled edge of the dial. Across the middle of the marker is soldered a piece of middle of the marker is soldered a piece of No. 26 wire, which acts as a line to accurately take the readings. To make the marker match the rest of the set, the whole thing may be nickeled. A hole is drilled in the panel just above the dial through which is placed the switch point with the attached marker.

HONEYCOMB COIL MOUNTING

One of the most difficult instruments to construct so that it will operate smoothly and have a fine control is a three-coil variable mounting. In the sketch is shown a mounting that any experimenter may make, which should be satisfactory.

The vernier gears shown are taken from a discarded mandolin or may be purchased at a hardware store. The sub-panel that the gears are mounted upon is of bakelite or hard rubber and should be about four inches in length. The two brackets that hold this



A few odd worms and gears afford an excellent means for use in a coil mounting.

sub-panel to the panel of the set are made of brass strips 1/4 inch wide and 1/6 inch

The first operation in the construction of this mounting is to drill the sub-panel as shown. Dimensions will not be given here as they depend upon the type of gears used and also the type of coils. However, a preand also the type of coils. However, a pre-caution might be mentioned. Be careful in drilling the sub-panel to keep the drill at right angles to the sub-panel so that the shafts of the gears will run true. As may be seen in the sketches, the worm parts of the gearing system are attached to the dials of the set.

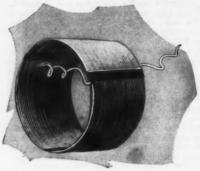
The manner of attaching the coils to the

gears may be done in any number of ways. The simplest is to drill a hole in the standard mounting that comes with the coils of such a size that they may be fastened securely to the vertical shafts of the gears. It will be found that this system of mounting honey-comb or spider-web coils is one of the best that has yet been tried.

Contributed by John Hayek,

A LOW LOSS SPACE-WOUND COIL

The following is a description of a coil having very low electrical losses and suffi-cient mechanical strength to enable it to be used under the most rigid conditions.



An efficient form of inductance. The coil is space wound and is self-supporting.

This coil eliminates two undersirable features found in other popular low loss coils, viz., the danger of short-circuiting turns as in the "basket-weave" type and the high distributed capacity as found in the "pickle-bottle" type.

Any size wire between No. 12 and 20 will

be satisfactory for winding the coil, How-ever, it is recommended that No. 16 or 18 be used if possible. Obtain a bottle whose diameter is equal to that of the coil to be constructed. From a piece of gum paper tape cut out three strips T_0 inch wide and approximately three times as long as the finished coil is to be. Several rubber bands will come in handy here to hold the tape strips on the bottle while the wire is being wound on. The turns should be spaced by wound on. The turns should be spaced by a string which is wound on along with the wire. Ordinary wrapping twine will be satisfactory for the smaller wire, but something bigger should be used for the larger sizes. When the correct number of turns larger have been wound on, fasten the end of the have been wound on, fasten the end of the wire by another rubber band and remove the string. Apply a thick coat of collodion on the wire over the tape strip. Allow this to dry and put on a second thin coat. Moisten the tape not covered by the wire and collodion and press down while it is still sticky. When this dries, break the bottle and remove the completed coil.

Contributed by E. F. Powell,

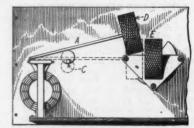
A SIMPLIFIED COUPLING

CONTROL

The receiver constructor is often confronted with the problem of an unsymmetrical panel layout in favor of proper instrument spacing and efficient wiring, a neatly arranged panel seldom giving apparatus arrangement to permit of best efficiency and short connecting leads. For best efficiency, inductance coils are mounted directly on the condenser by which they are tuned, being placed at right angles to the plates. Variable inductive coupling to such coils gen-erally presents a difficult construction prob-lem, which is quite simplified in the method

A is a length of ¼-inch dowling, fastened by a small hinge and supported by a post on some one of the instruments, such as an

audio transformer. C is the shaft back of the panel, upon which is secured a small cam at an off-centered point, 180 degrees rotation of the dial on shaft C giving maxi-



Easy way to mount honeycomb coils. cam allows a vernier coupling adjustment to be had.

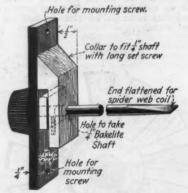
mum to minimum coupling between the two coils. The diameter of the cam used will vary with the length of A, also with the distance between the shaft C and the hinge; the longer the length of A, or the shorter the distance from C to the hinge, the smaller the cam must be. If D is the regenerative coil and the hinge is fastened to the first audio transformer, the wooden dowel can be replaced by a small brass rod and used as the connection between coil and transfor-Exact measurements of course must be determined in individual cases. If coup-ling changes obtained by rotation of the dial are too abrupt, this may be remedied by sliding coil D back on the dowel, giving greater spacing between D and E.

Although honeycomb coils are shown, the system is quite adaptable to other types and arrangements of which will be conditions, immediately suggested to mind.

Contributed by E. E. Griffin,

SPIDER-WEB COIL MOUNTING

One of the most difficult coils to mount as a rotor is a spider-web coil and the arrangement here is one that may be built with little trouble, and it should prove to be very satisfactory. A piece of hard wood 34 inch square and 3 inches long is cut and 34 inch square and 3 inches long is cut and filed, as shown in the accompanying sketch. A hole to take a 14-inch shaft is drilled through the middle section, and it might be well to add a caution here—be sure that the drill is held in a perpendicular position with respect to the face of the mounting. The



Arrangement for mounting spider-web coil

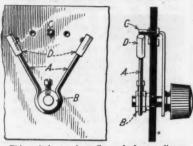
shaft is a hard rubber or bakelite rod 1/4 inch in diameter flattened at the end, so that it may be slipped through the turns of the spider-web coil. The collar shown may be one from a discarded dial and fitted with a set screw of such a length that it will strike against the side of the mounting, thus forming a stop and preventing the pig-tail con-

nections of the rotor from being twisted off. With the bearing secured to the panel as shown and the set screw tightened to the shaft, the shaft may rotate through about 300 degrees, smoothly and with no end play. The mounting can be fastened to the panel with the two screws above and below the shaft.

Contributed by W. C. Hall.

BACK PANEL SWITCH STOP

For the fan who is particular about the appearance of his panel, this switch stop will be a welcome idea. This stop requires no holes in the panel and may be adapted to the majority of the switches on the mar-



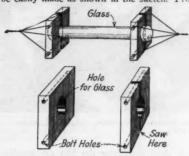
This switch stop is easily made from ordinary

In the accompanying diagram a length of square bus bar A is bent around the collar of the switch lever, B. This bus bar is bent so that the switch will stop at the end points, the bus bar being stopped by a piece of heavy wire soldered to the middle switch point, as shown at C. A length of spaghetti is placed over each end of the stop as indicated at D. This bus bar is soldered to the collar of switch lever.

Contributed by Lawrence Engebretson,

GLASS ANTENNA INSULATOR

A cheap and efficient antenna insulator can be easily made as shown in the sketch. Pro-



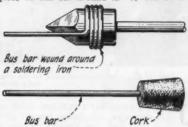
A good antenna insulator can be made with two blocks of wood and a glass towel rack.

cure glass towel rods, which may be purchased at any plumbing establishment, about 15 inches in length. Two blocks of wood for each insulator 5 inches square and 34 inch thick are drilled as follows: In the middle of the block a hole slightly smaller than the rod and through the block perpendicular to the large hole two holes large enough to take a 1/4-inch bolt 3/4 inch from the top and bottom of the block. The blocks are then sawed in half through the three holes. The glass rod is placed between the two halves of a block and fastened there by tightening the bolts through the small holes. The supporting wires of the antenna may be fastened to the bolts.

Contributed by Raymond Hadley,

USES FOR BUS BAR WIRE

Have you ever, while wiring a set, found that your soldering iron was $\frac{1}{10}$ of an inch too large to get into some corner? Instead of tearing the set apart next time, just allow the soldering iron to cool off and wrap a piece of bus bar around it. It will do the



An easy way to solder out-of-the-way joints, using bus-wire.

trick very nicely. If there are a number of such places in your set, procure a large cork and insert about three inches of bus bar in it. This will serve as a soldering iron, the only disadvantage being that it will not stay hot very long.

Contributed by A. A. Blumenfeld.

Novel Coil Winding Machine

HE pastime of winding coils has become exceedingly popular nowadays, and it would be a difficult job to conceive of a dyed-in-the-wool radio fan who does not have a great number of coils of wire and tubes of insulating material scat-

his radio proclivities. There are many ways of winding coils; the writer has often rolled the forms on a table with one hand while guiding the wire with the other. He has also used various means of mounting the outfit in bearings to be turned with a crank.

tered around either in his bedroom or the cellar, depending upon where he exercises

But these are all makeshifts, and the difficulty experienced in trying to make the af-fair work properly generally more than counteracts the expected advantages.

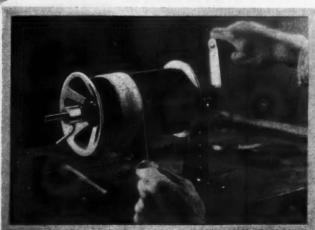
The photographs show a new type of machine put out by a leading tool manufacturer; it is very simple in construc-tion and just as simple to operate. The photographs are tion and just as simple to operate. sufficiently plain so that no further description is necessary. Many kinds of single or multi-layer coils can be wound on this machine, using cylindrical forms, and spaced winding can be obtained by winding two strands at the same time, removing one strand after the operation is completed.

When fine wire is being wound on a coil form, there is a tendency for the wire to lap over itself. This necessitates turning the handle backwards, until the wire is again straight. A small spring brake when depressed, allows the coil to be reversed in direction, and prevents the wire from

unwinding when in the normal position.

The stand is provided with holes which allow it to be fastened to the workbench, or if so desired, the coil winder may be placed in a vise in any particular position. The base is of cast iron finished in black enamel, while the center rod is of steel. Both coil guides are of aluminum and are tapered so as to conform with the size of the various forms to be wound. A small wooden knob on the handle completes the outfit which is trimmed with red.

many novel features. Coils one-half to five in ches in diameter and from one-eighth to ten from one-eighth to ten inches long can readily be wound with little difficulty.



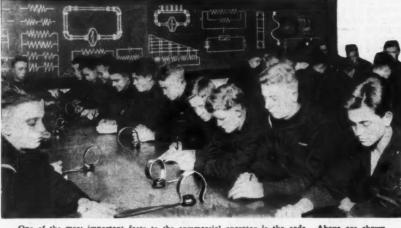
Specialize! By HOWARD S. PYLE

R. PYLE gives an excellent illustration in the accompanying article of how to get

The radio field today is becoming so tremendous that it has long ago been split up into various sections. We have specialists in broadcasting, specialists in set manufacturing, specialists in the manufacture of instruments, specialists in radio laboratory work, and dozens of others in an everincreasing number.

The young man who thinks of start-ing in radio will do well to first familiarize himself with the particu-lar branch of radio in which he thinks he is most interested. It is impossi-ble, today, to be a radio man and know the entire art. It has become too big the entire art. It has for that.—EDITOR.





One of the most important facts to the commercial operator is the code. Above are shown Navy students studying it.

UST the other day a stranger called on me, and after introducing himself as a man who had just recently become a "radio addict" said, "I understand that you have been in the radio game for a good many years; perhaps you will be willing to advise me just what particular set or type of set I should purchase, to get really satisfactory entertainment from the broadcast stations?"

A common enough question, particularly to those of us who have been associated with the science for some time. My visitor naturally assumed that I could advise him quickly and accurately, and was therefore con-siderably surprised when I replied, "I'm

Vacuum tube investigation next came in for a share of attention, and then the war with its feverish activity—the rapid development of oscillating vacuum tube circuitsfast moving improvement in existing apparatus of the older systems—the problems arising from increased traffic and the result-ing interferences, which followed the signing of the armistice.

And then—radio broadcasting with its myriad of applications—its trick circuits the invasion of the field by all classes of experimenters and their resultant develop-

A short time later the first arc installa-

This made an additional subject to

tions, opening the field of high power, point-to-point service, began to make their appear-

be mastered by the man then engaged in the

profession as well as by the student of those

times. Constant improvement in spark transmitters as in receiving equipment further added to the necessity for diligent applica-

tion to study.

Followed the introduction of the high fre-

quency alternator for high power work. An-

other phase to be mastered, still keeping pace

with arc and spark equipment which con-tinued to hold the fore in their respective

Meanwhile, elaborate experimental work had been going on in "wired wireless" or carrier current transmission—in communicating with submarines and aircraft—the intro-duction of high-speed automatic transmis-sion—radio transmission of photographs—the radio compass—a hundred variations from
the original "ship to ship" and "ship to
shore" wireless of not so many years ago!
Where is the man who can keep intimately

abreast of progress along ALL these lines? He simply DOES NOT EXIST! It is no



The advent of broadcasting has inaugurated the trade of radiotrician.

sorry, but I am afraid that my advice would be of little value, and I am sure that you could obtain much better information from some reliable house dealing in radio broadcast receivers and parts.

To him, perhaps, it did appear a bit odd that a radio man of long experience would suggest that he turn to a non-technical and comparative newcomer in the profession for the information which he desired. But was it? Suppose we analyze the present radio situation and compare it with that of a few short years ago.

Fifteen-ten-yes, but a scant five years ago, a man either was or was not a radio man. The term signified that he had a pretty thorough understanding of the applications of radio in all its branches and a good all around radio technician. Today, there IS NO SUCH MAN! I'll try and qualify that statement in the following paragraphs.

A BIT OF HISTORY

Let us go back, say ten years. To be a good general radio technician, a man was required to be familiar with the theory, functioning, installation and operation of radio telegraph apparatus of the spark type. Such equipment was at that time, with few exceptions, used solely for communication between vessels at sea and from ships to

reflection on the ability of our present-day electrical and radio engineers to make such a statement; it is simply beyond the possi-bilities of the human mind to grasp and re-tain such a mass of information as is essential to be an all around radio technician to-

There is but one answer that applies alike to the young fellow contemplating entry into the radio field as a career and to the timer" who is struggling in a vain effort to keep up with the fast moving developments the science: he must specialize

Radio has developed into a highly special-(Continued on page 2114)



The two photos here show some of the diversity of the industry. Above is a broadcast station control board and below at the left is the operating room of a coastal station.

HOW DOES IT WORK?



"Five-tube receiving set brings in distant stations WITHOUT ACCESSOR-IES list \$60." This remarkable set was in the Oakland (Calif.) Tribune, December 27, 1924. This receiver sure is worth sixty of the hard earned ones no batteries, phones or antenna being needed. We would like this system, as battery costs do make a battery costs do make a

IS THIS SAFE AND SANE?

Is THIS SAFE.

In the St. Louis Post
Dispatch of February 15,
1925, in an article on selecting tubes, they refer to
"the various amplifier
ROCKETS." Although
directions are lacking, we
believe that when the filament battery is connected,
the ROCKET shoots to the
desired station, thus making the operation very simple.



Contributed by C. F. Johnson.

SIMPLE? TRY IT YOURSELF



On February 8, 1925, the Rochester (N. Y.) Sunday American gave this advice: "Turn dial number two until whistle in the SHAPE OF A V is detected. Then GET INTO THE EXACT CENTER OF THE V and slowly disengage the PLACES of condenser number one." Outside of needing an X-ray outfit to find the V-shaped whistle and a panel stretcher to move the condenser about, nothing much is required.

Contributed by G. H. Putnam.

QUITE A STROLL

OUITE A STROLL

The Montreal Standard, of February 21, 1925, printed a photograph with the caption, "English radio fam and the set ON WHICH HE WALKED to Boa Vista, Brazil, 7,000 miles away." We have heard of riding across the desert on a bicycle and other marvelous feats, but this Englishman is strides ahead of these.

Contributed by W. E. Hawthorne.



LOVING COILS



In the January 24, 1925 issue of the New York Sun appears an advertisement telling about "a low-loss OSCULATOR coil." This must be an invention for the radio set of the lovelorn. Boy, page the sobsisters!

Contributed by Fred Alexander.

THE STRONGARM CIRCUIT

THE STRONGAE

The following is taken from the Acme Apparatus Company's advertisement in January, 1925, issue of Radio News: "The Acmeriex set brings DISTANT STATIONS RIGHT IN. TO THE HOUSE." Before using this, don't forget to warn friend wife that callers are coming, as it might be embarrassing to have some broadcast stations stroll in the door.

Contribu



Contributed by F. N. Bryce.

RAY FOR UNCLE



OR UNCLE

In the Reading (Pa.)
Eagle, January 15, 1925,
there was offered for sale
—"Three-tube Uncle Sam
TUNES set complete."
We were aware that the gent
of the stripped pants and
plug hat did fots for the
"dear peep-ui," but we did
not know that he was tuning sets.

ing sets.
Contributed by Thomas Seidel.

Radiotics



A DAMP CIRCUIT

The following advertisement of the Florence Radio Co. appeared in the Toronto Daily Star of February 17, 1925. "One Neutrodyne JET Work Rite mahogany Leabinet—" Umbrellas are supplied by the owner to keep the excess liquid notes from soaking the listeners. Contributed by Thomas Mulcahy.

SOME INSTRUMENTS

The Ace-High Magazine in the first February issue contained the following in its Exchange columns:
"One AMPLIFICATOR; 1 tube, 6 volts; 143 plate condenser—" Does an "amplificator" amplify radio or audio frequency, or does it amplify any old thing that comes along? As for the condenser, they forgot to advertise the block and tackle with which to mount it.

Contributed by Jos. Stewart.

INNOVATION IN "B" BATTERIES



In the Australian Wire-less Review, of November, 1924, an article was found: "The 'B' battery — of 120 BOLTS —." How "The B pattery" How the radio art does progress! We wonder if these are "bolts from the blue" or the common stove variety.

Contributed by E. P. Blackwood.

If you happen to see any humorous misprints in the press, we will be glad to have you clip them out and send to us. No RADIOTIC will be accepted unless the printed original giving the name of the newspaper or magazine is submitted. We will pay \$2.00 for each RADIOTIC accepted and printed here. A few humorous lines from each correspondent should accompany each RADIOTIC. The most humorous ones will be printed. Address all RADIOTICS to

Editor RADIOTIC DEPARTMENT,

c/o Radio News

A VERSATILE CONDENSER

In the December issue of Radio there appears the advertisement of a condenser. In part it reads:
". . . for any circuit, the Hico is a real worker. Four capacities. Beautifully made. LIVE HEAT, ELECTRIC SOLDERING IRON, LIGHT, DURABLE GUARANTEED ELEMENT." And we believe, folks, that at a slight additional expense it could be fitted with hot and cold water, and all the other comforts of home. Contributed by G. M. Hawes.



NEW GUN



The Baltimore (Md.) Evening Sun, of January 23, 1925, ran an advertise-23, 1925, ran an advertisement concerning something that the Navy should be informed of. It reads, "\$55.00 Three-Tube Halowell RE-FLEX RIFLE, \$22.50." Now, gentle reader, we ask you, did you know that reflexed tubes were used on guns? Maybe the Swiss Navy uses them on their

cruisers.

Contributed by Eugene Smith.

ATTENTION, POWER LINEMEN

The fellows who work on high voltage lines will be glad to learn that the Wholesale Radio Service Co., of New York City, advertises in their catalog their "genuine moulded BAKELITE SOCK." Also think of the comfort of no more garters and no wrinkles about the ankle.

Contributed by S. T. Belden.

MEDICAL AID FOR TRANSFORMERS



In the Pittsburgh Post Radio Broadcasting News. of December 24, 1924, is an item telling about an interesting medical operation: "The thickness of the core was reduced to reach the saturation point, which would reduce the HVS-TERICS." Now, if there is an hysterical transformer in your set (detected by howls, yells, etc.), eald have him amputate some Dr. Hackensaw and

Contributed by John March.

FOR THE DX HUNTERS

In the January 17 issue of the Radio World, we find a circuit diagram for the "DX WINDER." Well, boys, such a thing sure would simplify matters. Merely reel in whatever program you wanted, although we can't see how on earth the rope is to be stored in a "two by twice" apartment.

Contrib



. Contributed by H. Dunker.

TUBES HALVED

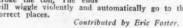


The Minneapolis Sunday The Minneapolis Stinday Tribune, of February 1. 1925, ran an advertisement which reads: "½ TUBE RADIO SETS, \$15.00." Now that's what we call cutting operating expenses although just which half of the tube has been eliminated has been kept a dark secret.

Contributed by Berdette Fogle.

VERY TICKLISH

Here's a hot one from the Correspondence Dept. of the Montreal Daily Star, of January 17, 1925. M. B. McM. asks: "Which ends of the TICKLED coil go to of the TICKLED coil go to the plate or high ratio transformer?" It's this way, Mac old boy: you catch a snipe in the full of the moon and with one of its tail feathers gently stroke the coil, The ends will wiggle violently and automatically go to the correct places.



MR, BELASCO, PLEASE NOTICE



PLEASE NOTICE
In the Charlotte (N. C.)
Observer, of January 29,
1925, the Specialty Shop advertises: "One new
SUPERHERODYNE." Is
this the instrument that the
heroine uses when she locates the stolen papers in
the villain's safe, thus saving the hero from a fate
worse than death?

Contributed by
Thos. Pitts.

BACK TO THE FARM

In the American Radio
Transmitter, for January,
1925, a set is advertised
using "WD 12 RUBES."
We were aware that there
was great agitation in Congress over the Farm Bloc,
but by Chowder, we didn't
know that it influenced
radio, too. It is reported
that the sockets are a combination milk stool and
mowing machine seat.

Contribu



Contributed by E. K. Lewis.

MUST BE A ROUGHNECK



On December 26, 1924, the Miami (Fla.) Herald had the following advertisement: "LOW SPEAKER—AI shape \$85." No wonder the owner wanted to get rid of an instrument that had as bad manners as that one had. Imagine how embarassing it would be if the minister came to dinner and vivid "coises" for the born. Contributed by A. H. McKillop.



ADIO manufacturers are invited to send to RADIO NEWS LABORATORIES, samples of their products for test. It does not matter whether or not they advertise in RADIO NEWS, the RADIO NEWS LABORATORIES being an independent organization, with the improvement of radio apparatus as its aim. If, after being tested, the instruments submitted prove to be built according to modern radio engineering practice, they will each be awarded a certificate of merit, and a "write-up" such as those given below will appear in this department of RADIO NEWS. If the apparatus does not pass the Laboratory tests, it will be returned to the manufacturers with suggestions for improvements. No "write-ups" sent by manufacturers are published on these pages, and only apparatus which has been tested by the Laboratories and found to be of good mechanical and electrical construction is described. Inasmuch as the service of the RADIO NEWS LABORATORIES is free to all manufacturers whether they are advertisers or not, it is necessary that all goods to be tested be forwarded prepaid, otherwise they cannot be accepted by the Laboratories. Apparatus ready for the market or already on the market will be tested for manufacturers, as heretofore free of charge. Apparatus in process of development will be tested at a charge of \$2.00 per hour required to do as heretofore, free of charge. Apparatus ready for the market of already on the market will be tested for manufacturers, as heretofore, free of charge. Apparatus in process of development will be tested at a charge of \$2.00 per hour required to do the work. The Laboratories shall be glad to furnish readers with technical information available on all material listed here on receipt of a stamped envelope. The Laboratories can furnish resistances of the various instruments, amplification curves of transformers, losses in condensers, etc., and other technical information. Address all communications and all parcels to RADIO NEWS LABORATORIES, 53 Park Place, New York City.

Apparatus Awarded Certificates

FARRAND-GODLEY LOUD SPEAKER

Electrical tests of radio apparatus indicate that a considerable amount of distortion present in the average broadcast receiver is often caused by the loud speaker. Many of the lower tones of orchestral music are often lost when using some types of loud



This speaker has no horn, speakers. This speaker has no horn, but employs an 18-inch paper cone diaphragm. It responds to a wide audio frequency range and the quality of reproduction, as well as the volume, is good. Manufactured by the Farrand Mfg. Co. \$32.50. AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 719.

MU-RAD "B" RADICATOR UNIT

With this unit the radio set owner may operate his set directly from the 110 volt, 60 cycle lighting circuit. The unit consists of a step-up transformer, two UV-201A or C-301A tubes as rectifiers, and a filter. The whole is encased in a metal box and occupies small space. It effectively



supplies plate current for an eight tube set at both detector and ampli-fier voltages. No objectionable hum is present. Manufactured by Mu-Rad Laboratories, Inc. \$49.50. AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 709.

MILLIVOLT TESTER

The radio experimenter and set builder often requires a test set for determining the continuity of coils and circuits. The millivolt tester man-uíactured by the Adbro Míg. Co.,

serves this purpose very well. To use, simply clamp one of the cord tips of a telephone headset in the chuck on one end of the tester.

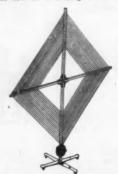


The cap of the tester is then removed and the inside moistened. After replacing the cap, a loud click will be heard in the headset when the other cord tip is touched to the end of the cap. A click will be heard with a resistance as high as 1,000,000 ohms in the circuit. Price \$1.25.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 734.

LINCOLN COLLAPSIBLE LOOP AERIALS

These aerials are of excellent con-struction, having insulated stranded wire supported by a wooden frame that sets in a folding metal base.



The loops are made in two styles, one with three terminals having one tap connection and the other with a four point tap switch. The loops have 17 turns, being 18 inches on a side. Manufactured by the Lincoln Radio Corp. Price of plain loop, 86.00, and of tapped loop, \$8.00.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATES OF MERIT NOS. 710 AND 711.

NION FIXED DETECTOR



This fixed crystal detector is of the cartridge type and is very sensi-tive. The crystal is enclosed in the insulating tube with nickel plated lugs at each end for connections.

Manufactured by the Keystone Products Co. Price, \$1.00.
AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 737.

EASTERN R.F. TRANSFORMER

The "pickle bottle" coil shown in the illustration is self-supporting and of excellent electrical design. The primary is wound directly on the eccondary, as shown. Brackets are furnished for mounting. It covers



the entire broadcast range when used with a .00035 variable condenser. Manufactured by the Eastern Coil Corp. Price, \$2.00. AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO 735.

BALKITE "B" CURRENT SUPPLY

SUPPLY
This chemical rectifier is very quiet in operation. It furnishes "B" battery current for detector and amplifiers of standard receiving sets. It gave excellent results when used with an eight tube Super-Heterodyne, causing no objectionable hum. It is designed for use with the 110 volt, 60 cycle lighting circuit. Manufactured by the Fansteel Products Corp. Price \$55.00.



AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO 713.

JONES DISPLAY OUTFIT

This display outfit consists of a panel with 12 instruments mounted

upon it. Six of the instruments are telephone jacks of various types. The other six are switches. The mechanical construction of the inthe



struments is good. The switches are provided with red bakelite knobs and furnished in sizes ranging from single pole single throw to double pole double throw. The jacks are furnished in sizes ranging from single circuit open to double circuit filament control. Submitted by the Jos. W. Jones Radio Manufacturing Co. Price 70c to \$1.60.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 718.

DE-JUR RHEOSTAT The type C, 20-ohm, De-Jur fila-



ment rheostat is manufactured by the De-Jur Products Company. The instrument is well constructed and safely carries the current required of it. The molded part is of bakelite. Price, \$1.10.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 730.

CRYSTAL DETECTOR Maurice Schwartz & Son sub-mitted a sample of their adjustable



crystal detector. This instrument is of the double crystal combination type and is very sensitive and easily adjusted. The base is of fibre.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 736.

DE-JUR POTENTIOMETER

DE-JUR POTENTIOMETER
The type C, 400 ohm, potentiometer is of the same general construction as the De-Jur rheöstat described
above. Excellent contact is maintained between the lever arm and the
resistance element. Manufactured by
the De-Jur Products Company, New
York City. Price, \$1.25.

AWARDED THE RADIO NEWS
LABORATORIES CERTIFICATE
OF MERIT NO. 731.

GARDINER & HEPBURN JUNIOR CONDENSER

Where a small vernier condenser or a balancing condenser is required for use across the main tuning con-denser of a single dial set, this little



instrument will be found very convenient. It is of the same general construction as the usual grounded rotor type except that it is very small in size and has a maximum capacity of .000022 mfd. Manufactured by Gardiner & Hepburn, Inc., Philadelphia, Pa. Price, \$1.50.

AWARDED THE RADIO NEWS OF MERIT NO. 732.

FIL-CO SWITCH

The illustration shows the filament switch manufactured by the DX In-strument Company, Harrisburg, Pa. The switch is neat and compact and



of high grade workmanship. It is positive in action and safely carries the filament current used in the aver-age radio set. Price, 50c.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 733.

VARIABLE CRYSTAL DETECTOR

The Mar-Co variable crystal detec-



inclosed in an insulating cylinder which may be rotated for adjustment. The cylinder is supported in a metal casing mounted on a hard rubber base. It is small in size and sensitive. Manufactured by the Martin-Copeland Company, Providence, R. I.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 724.

HAFNER HYDROMETERS

Hydrometers for testing the condition of "A" and "B" storage batteries are manufactured by the Hafner Mfg. Co., 3128 Caroll Ave., Chicago, Ill. The hydrometers are of the usual construction and are accurately calibrated. The "B" bat-



tery hydrometer differs from the "A" battery hydrometer in that it has a smaller intake tube so that it may be inserted in small sized "B" batteries. Price for "A" battery unit, \$1.00 and for "B" battery, 75c.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATES OF MERIT NOS. 727 AND 728.

ANTENNA RIBBON

The antenna ribbon made by the Valley Narrow Fabric Co., Pawtucket, R. I., consists of webbing into which are woven thin coppered



strands. The material works very well as an antenna and is especially recommended for indoor use where appearance is important.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 706.

TECNICELL "B" BATTERY

This storage "B" battery is manufactured by the American Storage Battery Company, 326 Newbury St., Boston, Mass. It consists of 12 glass jar cells in a treated wooden tray. It may be charged at a rate of one ampere and on account of the large size of the cells, it will furnish "B"



hattery current to the average set for a long time. AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 712.

AUTOMITE CRYSTALS

The Keystone Products Co., Royal Oak, Mich., also submitted samples of its automite crystals and catwhisker contacts. The crystals are very sensitive and have a rough surface that easily holds the light contact adjustment. They arrived well packed and in excellent condition.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 738.

CONSOLE CABINET

The Express Body Corporation, Crystal Lake, Ill., has recently placed on the market several sizes and styles of radio cabinets. These cabinets are made of Douglas fir lumber from the Pacific Coast, kiln dried and selected for grain and texture for cabinet work. The



wood takes stain beautifully and can be finished to match any furniture. The style No. 37 cabinet, shown in the illustration, was submitted unfinished.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 705.

SURE TIGHT CONNECTORS



These connectors are simply tips ad lugs with clamping screws for

attaching to telephone cord terminals or wires. They are nickel plated and will be found very handy around the radio laboratory. Manufactured by the Illinois Radio Co., Springfield, Ill.

AWARDED THE RADIO NEWS LABORATORIES CERTI-FICATE OF MERIT NO. 696.

YAXLEY MIDGET SWITCH

The No. 10 "A" battery switch manufactured by the Yaxley Ap-proved Radio Products Co., 217 North Desplaines St., Chicago, Ill., is shown in the accompanying illus-tration. The knob turns a fibre cam that opens and closes the contacts.



The contact springs are similar to those used in telephone jacks except that they have a right angle bend that improves the operation and makes the instrument compact. Price, 60c.

AWARDED THE RADIO NEWS
ABORATORIES CERTIFICATE
OF MERIT NO. 725.

COSMOS LOW LOSS COUPLER

Low loss radio instruments are essential for selective reception. The low loss tuner shown in the illustration is designed with this end in view. The coils are self-supporting and wound with large wire. The tuner covers the entire broadcast range when used with a .0005 tuning condenser. It has three windings, primary, secondary, and tickler. Manufactured by the Cosmos Radio Corporation, 145 West 45th St., New York City. Price, \$5.00.



AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 726,

MUELLER SPRING CLIPS

Spring clips are always required around the radio set for battery connections and other purposes.



The Mueller clips are furnished either plain or lead coated, the coated ones being used for storage "A" and "B" battery connections. Manufactured by the Mueller Electric Company, Cleveland, Ohio.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 699.

SCIENTIFIC FIXED CRYSTAL DETECTOR

The small size of the parts of this crystal detector makes it ideal for



reflex circuits or other crystal cir-cuits where a permanent and sensi-tive adjustment is desired. The de-tector is enclosed in a metal case, the cap of which may be removed

for making adjustments of the cat-whisker. Manufactured by the Sci-entific Research Laboratories, 50.2 North Howard St., Baltimore, Md. Price, \$1.00.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 739.

MAR-CO DOUBLE POLE ROTARY SWITCH



The double pole double throw and the series-parallel switch manufactured by the Martin-Copeland Company, Providence, R. I., is of the panel mounted type controlled by a knob. It is of good construction and neat appearance. The illustration shows the double pole double throw switch.

AWARDED THE RADIO NEWS ABORATORIES CERTIFICATES OF MERIT NOS. 722 AND 723.

LOUD SPEAKER

James M. Davis Co., 30 Euclid Arcade, Cleveland, Ohio, submitted a



sample of their loud speaker which was found to be very sensitive and reproduced with good quality. The instrument employs a Mozart-Grand unit. It is of small size and near appearance. Furnished with a fibre horn.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 714.

MAR-CO DOUBLE POLE SWITCH

This small size double pole double throw knife switch is of rugged construction and pleasing appearance. It is specially designed for radio apparatus and the set builder will find it very useful. Manufactured by the Martin-Copeland Co., Providence, R. I. 4



AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 720.

MAR-CO SINGLE POLE SWITCH

The single pole single throw knife switch manufactured by the Martin-Copeland Company, Providence, R. I., is of the same general construction as the double pole switch described above. It may be used in battery circuits and in various other places on the radio receiving or transmitting apparatus.

AWARDED THE RADIO NEWS LABORATORIES CERTIFICATE OF MERIT NO. 721.

Correspondence from Readers

A Radio Mystery

OUR readers well remember the exploit of the author of this story, Mr. Rex Durrant, R.A.F., who, in 1919, flew from England to America in the first dirigible to cross the ocean, the R-34. Mr. Durrant was the radio operator at the time, his story appearing exclusively in the August, 1919, issue of Radio News. When we received the accompanying article the immediately sensed a

ing article, we immediately sensed a real mystery. There cannot be many radio girls in this country. We do hope, therefore, that if SHE reads these lines, something may happen after all,-EDITOR.

THE MISSING RADIO GIRL By REX DURRANT

HY, hullo C., you've sure been on some long trek some long trek have caught a glimpse of you since the . . . This was the Lord knows when. . . ." This was the cheery greeting I received as I entered the old Radio Club in that little village in Europe, called London, after many weary moons spent in erecting, and doing the hundred and one jobs of a radio man when one has even, as I'd been, beyond the track of railroads; out in the limitless deserts of Asia and Africa.

I was back again for a spell of leave, looking at the great metropolis which appeared just as I left it, its lights, its river, its social whirl, all at their zenith.

Attractive and mysterious as other cities can be, there is something so throbbing, alive and magnetic about London that, as the wanderer returns once again, he feels the encircling grip of her wide arms.

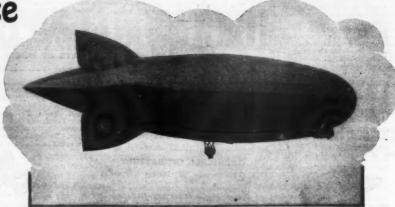
The steward appeared . . . our glasses were filled with a suitable mixture to keep out the fog, and a blue smoke haze arose from our pipes and cigarettes as our little circle of radio bugs got busy on a discussion of the application of radio to direct

pilotless airplanes. My latest experiments, I said, led me to believe that there will be no air pilots in a future war . . . except, possibly, the single-seater fighter. Radio tests in my snug little den on the sea coast had convinced me that distant control of a flock of bombing machines was quite within the bounds of possibility; launching into technicalities I was suddenly stopped by a chorus, "That's not good enough, boy; if you are in form for a yarn, tell us that story of the episode in New York! Oh, yes," came the incoming wave of voices . . . "I M I, I M I, come

Nothing loth, I suddenly saw the vision of the swirling Hudson, the Statue of Liberty . . . and . . . New York My train of thought was suddenly interrupted by the loud speaker fitted in the corner of the room rolling out the solid notes of Ben striking the hour of 7 p.m.

"Well, you fellows, I've got a date with the sweetest little peach in creation in 50 minutes, so I shan't keep you long.

"I suppose most of you recollect the R-34, that clipper of the clouds, that came over from Europe to U. S. A., thus bringing into actual accomplishment the dreams of Jules Verne, and Kipling; well, guys, I was the budding young radio fan aboard that craft. . . . What's that? . . . Oh, yes, I'd striven



The R34, first dirigible to cross the Atlantic, on which Mr. Durrant was radio operator.

for the job long enough. . . . My fan days were over, and in the glare of the professional limelight I felt I must make good, and push the cause of radio in the air.

"It was some 'get busy' trip over the eternal cloud world of the vast Atlantic.

"You can guess the thrill I had, when I held Boston each way at 2,000 miles; some DX in those days; it made me think how much we owe to DeForest, the man who put the third electrode in the bulb, and made such things possible.

"After four days of continuous air travel,

the hum of the giant engines became a wel-

those are locked up in my own special transformer.

"I can see her now . . . lissom, dainty, fascinating; how we danced, and talked, and, through those talks, I discovered she was a hold your chairs tight . . . SHE was radio fan!

"Could I come and see her Super set?
. somewhere near Bronx Park; Pa was on Wall Street (he wouldn't be home, and if he was he wouldn't mind two hoots) . . . We went, and got immersed in radio . and other things.

"The next day we were scheduled to leave . . . we spent it somewhere near Southampton, L. I. When a radio man is in love, it's like getting across your H. T. condenser when the juice is on. You curse at the time you do it, but you've a secret delight at having experienced it.

That night came only too swiftly. There was her little face smiling up at me, as, smothered in fur, begoggled, and with tight fitting phones on, I gazed down at her from the radio cabin . . . the wind was whistling in from the Great Lakes . . . time was getting short . . a last kiss and we swept up into the midnight air.

"My aerials were soon adjusted, . . . sets bing QSA . . . DUTY only, was now going QSA . . . imprinted on my mind; for the safety of us all depended on RADIO. As the glittering lights of the Great White Way flicktrue C.W. note, calling me . . . over on the switches and my K K K rapped out into

the night.
"As my hand translated the cutest clipped "As my hand translated the cutest cupped sending of a feminine wrist, my heart beats went up some . . . IT was HER . . my ideal . . . I replied . . . NO, I'll be if I'll tell you HER message or mine. GN GN GN our tubes whistled, but not GN OM . . . but GN MP!! . . and sweeping along at 90 miles an hour we struck across the ocean for home."
"Well, tell us the end of the story," cried

everyone.

"That's where you have me guessing," I replied . . . "I wonder what SHE will think if she ever reads this."

YOUR CAR!

Are you interested in motoring, touring or camping? If you are, do not fail to read the May issue of

MOTOR CAMPER AND TOURIST

AND TOURIST

Here is a magazine that tells you things in connection with your care—things that you never even suspected.

Are you just running around the country or are you getting the full benefit of your car? MOTOR CAMPER & TOURIST shows you the way. On all newsstands.

CONTENTS FOR MAY ISSUE

The Yellowstone National Park,
By Ralph W. Pierson.

Rubber Trail to Coulter's Hell,
By Maurice H. Decker.

Lafayette National Park,
By R. Nattrass.

Motoring Through the Valley of the Moon,
By Earle W. Gage.

Mesa Verde National Park,
By Ralph W. Pierson,
Blue Ridge National Park,
By Darrell F. Holmes.

A Strenuous Journey,
By D. B. McRea. A Strenuous Journey, By D. B. McRea.

come sound; we realized that with each sweep of the propellers we were getting nearer to the New World.

Then the sight of Chatham, Mass. Martha's Vineyard . . . Fire Island, then the air on 600 meters got busy. We were called by tramps, sailing ships, liners, leviathans, to say nothing of New York with some bunch of call signs.

"I won't dwell on the landing, or the re-porter guy, who interviewed me while I was in Adam's attire, in the bath, and wanted to know about the static and the electrical horsepower of our transmitters! Of my wonder at the speed tracks, and of the Brooklyn Bridge, as our powerful Marmon auto rushed on to Fifth Avenue; there was RADIO NEWS at the hotel bookstore just making its début; thinner than it is today, but as cramful of interest.

"Then I met HER . . . wild horses won't drag out of me names or the meeting place;

DR. PICKARD AND "THE LADY OF THE LAKE"

Editor, RADIO NEWS

Month by month I have been reading your fascinating serial story, "The Life and Work of Lee DeForest." As one who also lived through the early and troublous days of radio communication, I have noted more than once slight inaccuracies in the story, and passed them aside as entirely pardonable nods from so busy a man as the hero.

In your last installment DeForest honors me by inclusion in the story of the yacht races of 1903, in the following words:

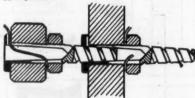
(Continued on page 2174)



Digest of Latest Canadian Radio Patents Compiled by G. F. SELLECK. Jr.

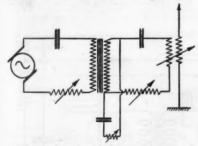
ELECTRIC CONTACT OR TERMINAL

Canadian Patent No. 243406, A. E. Chapman. Filed Jan. 31, 1924; issued Oct. 7, 1924.)
This invention relates to electric contacts or terminals and has for its object to provide an improved form of device of this nature which will be of universal application being capable of being used as a plug or socket, as a battery plug or as a coil holder, as a soldering tag, as a wire terminal, or in general in any situation in which an electric contact or terminal is or may be required.



The invention consists of a device comprising an externally screwed socket terminating in a tapered shank or like member, the latter being preferably capable of fitting and biting into the socket of another similar contact or terminal. It also consists in a device of the above character in which the socket is cap-headed so that it may co-operate with an ebonite, metal or other nut adapted to screw onto the exterior of the socket. The invention also consists in a device of the above character in which the tapered shank is formed as a helix or as a corkscrew, or as an ordinary wood or metal screw. It also consists in a device in which the whole or part of the biting surface of the tapered shank is constituted by a plurality of annular ridges of decreasing diameter toward the free end of the shank.

METHODS OF IMPROVING THE EFFI-CLENCY OF FREQUENCY MULTI-PLYING TRANSFORMERS (Canadian Patent No. 243260, Walter Dornig. Filed May 30, 1923; issued Sept. 30, 1924.) Frequency multiplying arrangement for wave transmission comprising a wave reducer, a pri-mary oscillation circuit, an iron-cored frequency multiplying transformer, for distorting the funda-

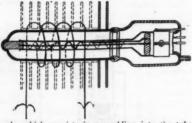


mental wave form through the magnetization curve of the transformer and for thus filtering out the multiples of the fundamental frequency in the primary circuit, a secondary oscillation circuit connected between the transformer of the wave radiator, and an auxiliary circuit connected to the transformer carrying upper harmonics of the frequency of the primary cricuit, said harmonics differing from the frequency derived from the secondary for operation purposes.

METHOD OF MAKING THERMONIC DEVICES

Canadian Patent No. 244434, F. S. McCullough. Filed April 22, 1924; issued Nov. 11, 1924. Assigned to A. S. Rogers.)
This invention relates to the construction and manufacture of electron or vacuum tubes, especially those constructed for the handling or control or relatively large currents, such, for instance, as the so-called power tubes used in radio broadcast stations.

The invention consists of a method of prepar-ing a high emitting low temperature cathode in electron tubes having metal shells with glass



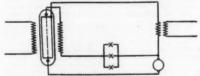
seals, which consists in assembling into the tube a cathode having a low temperature high electron emitting coating thereon, connecting the assembled tube with a pump, baking the entire tube to partially degasify it at a moderately high temperature but below the melting point of glass, then raising the temperature of the metal shell of the tube to a glowing temperature while maintaining the glass seal hot but below its melting temperature, the tube remaining in connection with the pump, and the cathode being heated in a vacuum by the radiation of heat from the shell, whereby the cathode is conditioned for service and degasified in a vacuum and in place in the tube.

ELECTRON DISCHARGE APPARATUS

ELECTRON DISCHARGE APPARATUS

(Canadian Patent No. 244350, A. W. Hull. Filed Dec. 12, 1923; issued Nov. 11, 1924. Assigned to Canadian Electric Company, Ltd.)

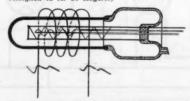
This invention relates to electron discharge apparatus of the magnetron type. In the operation of such devices for certain purposes it is customary to provide a polarizing magnetic field in order that the normal current flowing through the



device may be adjusted to a value at which small changes in the magnetizing field will produce large changes in the value of the current. If the source of potential employed for producing a flow of current through the device is a variable source the value of field strength at which the current will be reduced to substantially zero varies with the square root of the voltage and the strength of the magnetizing field required for maintaining a desired value of current will vary accordingly. The object of this invention is to provide a means for automatically varying the strength of the polarizing magnetic field to compensate for variations in the value of the potential applied between the electrodes.

THERMONIC DEVICES AND METHOD OF CONSTRUCTING SAME

(Canadian Patent No. 244433, F. S. McCullough, Filed April 22, 1924; issued Nov. 11, 1924, Assigned to A. S. Rogers.)

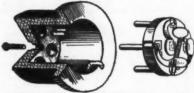


This invention is for a space discharge tube of the hot cathode type, wherein helium is present between the cathode and the anode of the tube, and for a method of making the same.

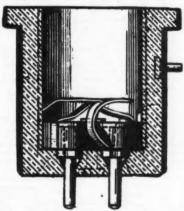
The method of making a space discharge tube having helium therein consists in assembling a tube having an anode and a cathode on which latter there is a substance capable of liberating helium when heated, exhausting and degasifying the anode and the cathode by exhaustion and baking, sealing off the tube, and applying a current to the cathode to heat the same, whereby helium is evolved in the tube

ADAPTERS FOR VACUUM TUBE SOCKETS

(Canadian Patent No. 244353, G. Butzke. Filed Feb. 7, 1924; issued Nov. 11, 1924. Assigned to Canadian General Electric Company, Ltd.)



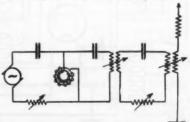
The object of this invention is to provide a hardy, compact and easily applied adapter whereby a miniature vacuum tube may be readily and properly connected to a standard radiotron socket or receptacle.



The invention comprises an insulating support having a plurality of external contacts thereon, means to position and attach said support to a socket, a plurality of opposite contacts electrically connected to said external contacts, and means to position and attach a small-sized tube to said support.

CIRCUIT ARRANGEMENTS FOR FRE-QUENCY MULTIPLYING TRANSFORMERS

(Canadian Patent No. 243718, Walter Dornig. Filed May 30, 1923; issued Oct. 21, 1924.)



This invention relates in general to rangements for frequency multiplying (Continued on page 2188)



HIS Department is conducted for the benefit of our Radio Experimenter. We shall be glad to answer here questions for the benefit of all, but we can publish only such matter as is of sufficient interest to all.

1. This Department cannot answer more than three questions for each correspondent.

2. Only one side of the sheet should be written upon; all matter should be typewritten or else written in ink. No attention paid to penciled matter.

3. Sketches, diagrams, etc., must be on separate sheets. This Department does not answer questions by mail free of charge.

4. Our Editors will be glad to answer any letter, at the rate of 25c for each question. If, however, questions entail considerable research work, intricate calculations, patent research, etc., a special charge will be made. Before we answer such questions, correspondents will be informed as to the price charge.

You will do the Editor a personal favor if you will make your letter as brief as possible.

SUPER-ZENITH

(2109) Mr. L. E. Moore, Durham, N. Y.,

asks:

O. 1. Please show the Super-Zenith circuit, with constants.

Q. 1. Please show the Super-Zenith circuit, with constants.
A. 1. We are showing the circuit in these columns. Note that the three, four and five turn coils rotate. They are fastened to the variable condenser rotor shafts and, therefore, turn as the variable condensers are adjusted. These rotating coils may be wound on tubes 2½ inches in diameter, with No. 24 or 26 D.C.C. wire (No. 22 or 24 D.C.C. wire being used for the remaining

24 D.C.C. were being used for the coils.

The seven- and ten-turn plate coils are fixed, being wound on the same three-inch tube as the fi-turn secondaries, but spaced from them about one-quarter of an inch.

The object in dividing each plate coil into two sections, with one section rotable, is to maintain a constant plate condition at all wave-lengths, rather than have possible oscillation at certain wave-lengths.

It is quite necessary that each tuned radio fre-

wave-lengths.

It is quite necessary that each tuned radio frequency transformer (61-turn secondaries) be in non-inductive relation to one another. Placing at an angle to the baseboard, similar to a neutroformer layout, is satisfactory.

The 2,000-ohm variable resistance must be non-inductive. A regular carbon or graphite type of resistance will be satisfactory.

The aerial, if short, connects to the end of the 20-turn aerial coil which is wound on the same tube as the 61-turn secondary, but separated about one-quarter inch from it.

tube as the 61-turn secondary, but separated about one-quarter inch from it.

In the commercial set the variable condensers that tune the grid circuits of the second radio frequency tube and the detector tube are mechanically arranged to turn with only one knob.

Standard storage battery tubes will probably

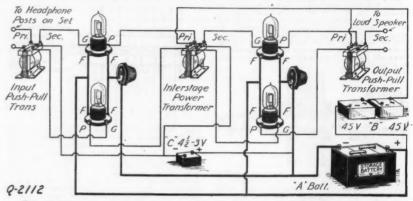
best results.

give I We

give best results.

We are showing one stage of audio frequency amplification, but the audio frequency amplification desired is optional.

Connect headphones to binding posts X1 and X2, if the audio frequency amplifier is not used. If three variable condensers are used to tune the set, the balancing condenser will not be required. This is only used to compensate for any variations, when two variable condensers are geared together. The balancing condenser need only be of three or four plate size.



This circuit shows how to connect two stages of audio frequency amplification, both of the push-pull type. A special "interstage" transformer is required.

A single dry cell, or a single flashlight cell, will be satisfactory for the 1½-volt "C" battery. Note that all constants shown (coil turns, etc.) must be considered as variable, depending upon individual conditions.

The construction of this receiver should not be attempted unless one has had considerable experience in making experimental sets.

Q. 2. What could be the explanation of weak signals from local stations when using a Super-Heterodyne having intermediate frequency iron core transformers marked "10,000 meters"? The filter coupler consists of two 250-turn honeycomb coils. A .002 mld. fixed condenser is connected across each coil.

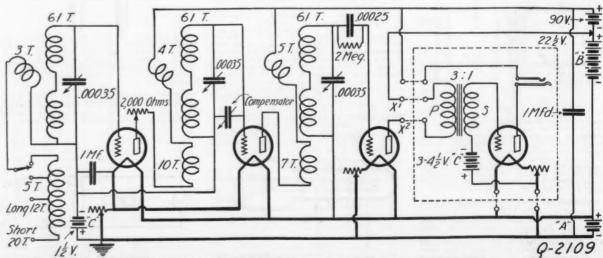
A. 2. The filter coupler must be sharply tuned (or nearly tuned) to the wave-length peak (that is, the wave-length at which the amplification is greatest) of the intermediate frequency, transformers selected. For that reason it will be necessary to use larger honeycomb coils than you now have. Try two 600-turn honeycomb coils shunted by two

variable condensers having maximum capacities of about .001 mfd.

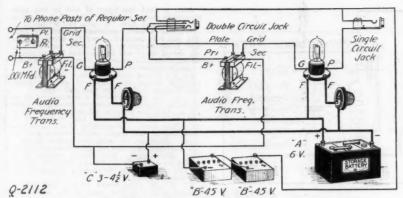
SUPER-HETERODYNE DATA

(2110) Mr. M. B. Brandt, New York, N. Y.,

(2110) Mr. M. B. Brandt, New York, N. Y., asks:
Q. 1. Why does my set not function better?
A. 1. From the data you furnish, we judge that the information you desire is contained in the answer to question No. '2 of Mr. Moore, above (Q. 2109). See the table of wave-length ranges of honeycombs appearing in the "I Want to Know" department of the January, 1925, issue of Radio News, page 1229.
Q. 2. Referring to the Super-Heterodyne article by Mr. Wilfred Taylor, page 1666, of the March, 1925, issue of Radio News, the caption of Fig. 6 refers (line 3) to "C3-001 mid. variable condenser, mica." What type of condenser is this?
A. 2. Condensers of the mica type are manufactured by Radio Industries Corporation, Connecticut Tel. & Tel. Co., and Crosley Radio Co.



th circuit. This is a successful method of preventing tube oscillation, without using neutralizing condensers. The construct quite complete. Regeneration and oscillation in the first tube circuit are perfectly controlled by a variable plate resistance. The construction



If this picture diagram is followed correctly, no one should have any difficulty in adding audio frequency amplification to any set.

See the advertising columns of Radio News.

This type of condenser comprises two metal plates spaced by a very thin mica sheet dielectric. A capacity three to six times greater than is possible with an air dielectric is the result. Such a condenser is quite suitable at the intermediate frequency wave-lengths for which it is specified.

Q. 3. Are UV-199 and C 399 tubes satisfactory for reflex and Super-Heterodyne receivers?

A. 3. These tubes will work very well in reflex circuits (excepting those of the neutralized type, in which the advantages of the standard storage battery tube are quite pronounced).

They are not as constant in operation as the standard storage battery tubes, under Super-Heterodyne demands. It is sometimes necessary to reactivate these tubes at short intervals (see the answer to Mr. Henry Smith (Q. 2067) appearing in the "I Want to Know" columns of the January, 1925, issue of Radio News).

DE FOREST D-17 SET

(2111) Mr. Frederick Neeley, Charleston, N.

(2111) Mr. Frederick Neeley, Charleston, N. C., asks:

O. 1.
DeForest D-17 reflex receiver?

A. 1. We are showing this circuit in these columns. In the commercial receiver the tuned radio frequency transformer shown is shielded from the rest of the set. The cores of the audio frequency transformer are grounded by being connected to the ground wire, as is also the shield of the radio frequency transformer. In the manufactured set, it has been found desirable to connect a wire from the large metal throat of the loud speaker to the ground. This ground wire has a .002 mfd. fixed condenser in series with it. We have not shown this in the circuit, as the experimenter will probably use an entirely different type of loud speaker.

The 50-turn radio frequency transformer secondary may be wound on a tube three inches in diameter. One-quarter inch from this winding, and on the same tube, may be wound the eight-or ten-turn primary. Wind both coils in the same direction with No. 22 or 24 D.C.C. wire. Connect the outside end of the primary winding to the

different makes of fixed radio frequency transformers in order to find two that are suitable for this set. Iron core transformers will most likely be best.

The audio frequency transformer ratios need not be exactly as shown, but the instruments must be of good design.

A loop aerial may be plugged into the loop jack. For additional range, one may try adding a ground and an aerial. Since this will broaden the tuning and greatly reduce or entirely eliminate the directional properties of the ordinary loop, it may be best to defer the use of an aerial and ground when powerful local stations are in operation.

When the head-phones are removed from the jack, the loud speaker is automatically put into operation.

A standard 2000 to 400-ohm potentiometer may

Operation.

A standard 200- to 400-ohm potentiometer may be used. This is not shown connected across the "A" battery as usual.

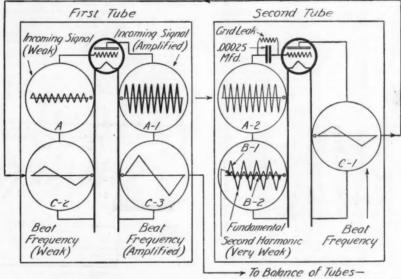
It is quite essential that low loss variable condensers be used.

Crowding apparatus closely together is to be availed.

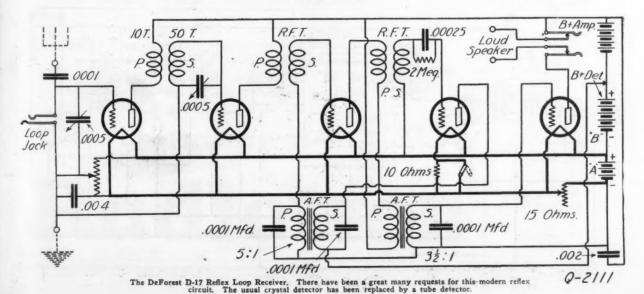
avoided.

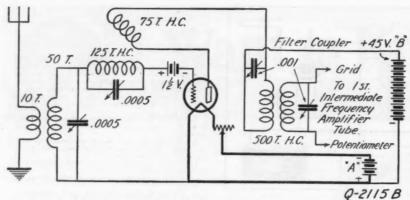
If storage battery tubes are used throughout, the 10-ohm resistance is shorted by means of the shorting switch (which may be of the push-pull type) shown. If a dry cell tube detector is used, this short is removed, thus reducing the brilliancy of the dry cell tube flament. If dry cell tubes are used throughout, the resistance is once more shorted and only two storage battery cells or three dry cells should be employed for filament lighting. three dr lighting.

plate of the first radio frequency tube and connect the outside end of the secondary to the grid of the second radio frequency tube. We suggest that the experimenter try several



The Second-Harmonic Super-Heterodyne principle of operation, graphically shown. The Q-2115 A





This circuit shows how the Second Harmonic, shown in Q-2115A, is generated. There are many possibilities of the principle. The values given are variable. A loop is recommended in place of the 50 turn inductance.

Q. 2. What are the addresses of the National Radio Trade Association; National Association of Broadcasters; National Radio Chamber of Commerce; American Society of Composers, Authors and Publishers, and of the Hazeltine Corporation who, I understand, license companies to use the Neutrodyne patents?

A. 2. The Hazeltine Corporation, 15 Exchange Place, Jersey City, N. J., have turned over the right to license manufacturers under the Neutrodyne patents, to the Independent Radio Migrs., Inc., 165 Broadway, New York City.

The other addresses you request are: National Radio Trade Association, 1133 Broadway, New York City; National Association of Broadcasters, 1265 Broadway, New York City; National Association of Broadcasters, 1265 Broadway, New York City; American Society of Composers, Authors and Publishers, 56 West 45th Street, New York City: American Association in England, France, Canada and the United States.

A. 3. The addresses you request are: British Esperanto Association, 17 Hart Street, London, W.C. 1, England; Central Esperanfiste, 51 Rue de Clichy, Paris, France; The Toronto Esperanto Society, 113 Maitland Street, Toronto, Canada; Esperanto Association of North America, 507 Pierce Bidg., Copley Square, Boston 17, Mass.

SPECIAL PUSH-PULL CIRCUIT

(2112) Mr. Lawrence Fazzano, Dumont, N. J.,

asks: 0. 1. Please show a picture diagram of a two-stage audio frequency amplifier that can be added to any receiving set, preferably to the detector tube of a regular regenerative receiver.

A. 1. We are showing a picture diagram of the amplifier you mention.

If standard six-volt quarter ampere tubes are used, the rheostats may each be of 30 ohms resistance. 2. 1.

sistance.

If the vacuum tube sockets are marked "fil. --"

Also, a fixed condenser of one or two mfds. sometimes assists greatly to reduce battery noises, when connected from "B" plus to "B" minus.

Whether a fixed condenser (usually of about 0.01 mfd.) is required across the primary of the first audio frequency transformer (as shown by the dotted lines) will be governed by the particular conditions of your receiving circuit and first audio frequency stage equipment.

Q. 2. Please show a picture diagram of an amplifier having two stages of audio frequency amplification, both of the push-pull type.

A. 2. For such a circuit it is necessary to use a special coupling transformer having a center tap on both the primary and secondary windings.

A push-pull amplifier of two stages will require four tubes. An amplifier of the usual type, consisting of two stages, would require only two tubes. However, by using the system shown in our diagram one is assured of extreme quality and high amplification. Still greater volume is obtained by using a "B" battery potential as high as 150 volts, with a "C" battery voltage of nine to twelve volts.

Q. 3. Is it necessary to use this type of amplification after one stage of the usual audio frequency amplification after one stage of the usual audio frequency amplification in the picture diagram can be used to amplify directly the output of the detector tube is preceded by one or more stages of radio frequency amplification, it will be more economical to use one stage of regular transformer coupled audio frequency amplification and then one stage of the push-pull type. Such a circuit is shown in schematic form in the "RADIO HOOK-UPS" section (circuit No. 66, sheet No. 14) of the December, 1924, issue of Radio News. In connection with this the correction mentioned in the answer to question number two, below, of Mr. T. D. Burnett (Q. 2114) is to be noted.

and "fil. +," these markings may be disregarded. It is often more desirable to connect an "A" battery negative or positive wire to a tube socket binding post marked just the opposite. Although sockets usually have polarity markings on the filament posts, as mentioned above, such markings are quite unnecessary in practical use.

The ratio of the audio frequency transformers should not be too high, otherwise distortion may be too great. A ratio of about 4:1 for the first transformer and about 3:1 for the second transformer is usually a good combination. However, individual transformers vary greatly in their characteristics and in consequence it is often possible to use altogether different ratios, with very satisfactory results.

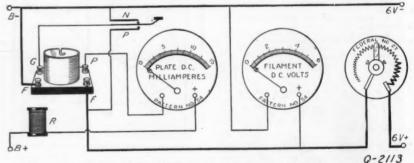
It is occasionally desirable to use a variable resistance connected across the secondary of the first or second audio frequency transformer to improve the quality.

TUBE CHECKER

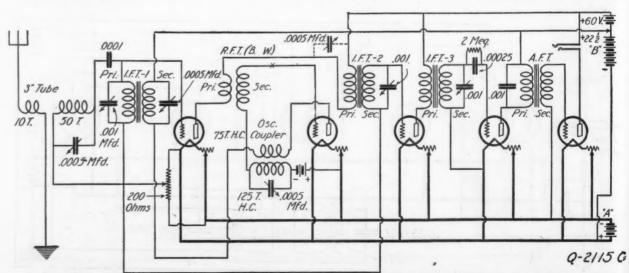
(2113) Mr. G. W. T. Kearsley, Roanoke, Va.,

Q. 1. Please give circuit and general informa-tion of the Jewell pattern No. 110 "Tube

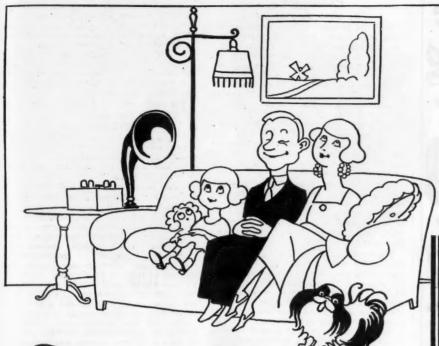
(Continued on page 2140)



This is about the simplest and most inexpensive instrument one can have for rapidly determining the D. C. characteristics of vacuum tubes. Tube Checker.



The Second-Harmonic Super-Heterodyne. Although an aerial is shown, a loop is recommended, unless the aerial is quite short. This receiver is considered as non-radiating since the first radio frequency tube has considerable blocking effect in one direction.



in everyti

In everything from a binding post to a vac-uum tube, there is quality. But quality counts most in the vacuum tube. A radio set can be built for distance, for clear tone, for volume. But to get the best out of any hookup -you want to fit it with genuine Radiotrons.

No matter what type of set you have-or what type of circuit you are buying tubes for -ask for Radiotrons by name - and make sure you get the genuine by looking on the tube for the word Radiotron and the RCA mark. Quality counts!

Radio Corporation of America

Sales Office: Suite No. 25 10 So. La Salle St.

233 Broadway

G

28 Geary Street





WD-12 UV-200 UV-201-A WD-11 UV-199 Radiotrons with these model numbers are only genuine when they bear the name Radiotron and the RCA mark.

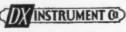


that all radio impulses reaching the antenna pass through your set, assur-

ing maximum reception.

Listed as standard under the re-examina-tion service of Underwriters' Laboratories.

For literature on improved reception send 2c stamp to Dept. RN 525.



Harrisburg, Pa.



INTERNATIONAL RADIO PROBLEMS

By CARL H. BUTMAN

With the passage of the bill carrying the State Department's budget of \$75,000, plans for the international Radio Conference to be held in Washington in September are being formulated. The actual agenda depends somewhat upon what action the World Telegraph Conference at Paris takes this summer. The United States will not be officially represented, as it is not a party to the convention. A careful study of the action taken there, especially with reference to the attitude of the World Powers will, however, be made by American governmental officials and radio experts, in order that the general trend of opinion on electrical communications may be followed.

It may be found more practical to eliminate discussion on strictly technical matters, such as specific wave channels, power limitation and such matters, as they might tie up development in a mass of technicalities, which could not be changed for three or four years.

The essentials of world-wide radio communications will be covered in the Paris conference, since they are incorporated under clause of the old telegraph convention of 1908, covering ship to shore radio com-munication. It is believed that the Paris conference will extend these regulations to cover trans-oceanic radio services. If this is the case, radio service in general, licenses, classification of messages, accounts and rates may be outlined at Paris prior to the American conference.

Other subjects which are likely to find a place in the discussions are general, though flexible rules to cover interference, also rates, services and methods of handling in-ternational radio traffic. The conference may thresh out wave-lengths to be used in ship-to-shore radio communication, as that question affects each country; the old plan of abolishing the spark apparatus may re-The assignment of suitable chanappear. The assignment of suitable chan-nels for international radio telephone broadcasting will undoubtedly be considered. Standardization is needed; abroad very long waves are used, compared with those employed in the Western Hemisphere. An international aircraft channel is becoming an important question, due to the development of air routes throughout Europe, where air-ships and planes fly over sevetal different countries in a day's trip. The international angles of aircraft wave-band may be considered as well as military channels.

It is quite probable that a broader conception may be placed upon the old plan for allocating of high-power commercial sta-tions throughout the world. Advanced thinkers on this subject believe that the location of commercial stations within the boundaries of a country is a matter for the particular country to determine. The inter-national allocation of signals, such as distress and general calls, as well as the as-signment of high-powered station call letters, will be discussed, although it is believed that this matter will continue to be handled by the central bureau at Berne. International broadcasting by amateurs may be considered, as recently the amateur has come into world prominence, and his call letters, although national, have no definite significance in another foreign country, and may be duplicated.

THE 1920 PRELIMINARY CONFERENCE

As most of the countries of the world are parties to either the telegraph or the radio conventions, it is likely that more than 50 separate governments will send delegates to the United States this fall to participate in the deliberations on radio regulations

In October, 1920, about a year before

America in general became vitally interested in radio, a preliminary radio conference was held in Washington, where representatives of Great Britain, France, Japan and Italy met to draw up an outline program for future discussion. Most of the visiting delegation were headed by the respective ambassadors and ministers, and the United States was represented by Under Secretary of State Davis, Postmaster General Burleson, Admiral Benson of the Shipping Board and Walter Rogers.

The conference laid down proposals under the following subdivisions:

RADIO PROTOCOL

The radio protocol of the Peace Conference; a universal communication union, composed of telegraph and radio sections; international telegraph, radio and cable laws, and improvements in the communication facilities between the five great powers.

The British submitted a plan for the amalgamation of all electrical communication rules and regulations to be submitted world's congress on communications, which, however, has never materialized. The standardization of stations, licenses and practically all phases of communications was proposed, including time signals and methods of reducing interference. An international alarm signal system, calculated to call operators not on watch in case of danger signals, was proposed and a new uni-

versal code or cipher system was outlined. The old international code system, a method of communicating between stations or ships of different nations, was pronounced out of date and not adapted for radio. vision for transmitting messages intelligible to all operators, regardless of the language they spoke, was planned for use in sea and aerial navigation; covering damages, sickness, stores, fuel, meteorology, ship and air-craft business, and other special needs. Recommendations for some technical im-

provements in communication services included the adoption of high-speed printing receivers, automatic transmitters and the multiplex operation of circuits so as to handle several messages simultaneously.

Although the State Department has made no official move toward calling the nations of the world to this conference, it is understood that formal invitations will soon be sent out, and the working up of a program begun. At an early meeting of the Inter-departmental Radio Advisory Committee, on which all government departments and bureaus having to do with radio are represented, it is planned to develop a definite government policy outlined by that committee some time ago. It is probable that this committee will form a neucleus of a technical advisory committee to aid the State Department officials detailed to handle the conference.

"LET NO MAN"

Radio bugs are now talking of marriage by radio. But just think, this is what you may get when you listen in:

Minister: "Do you dit-dat-dah-dah, dit-dah-dit Eloise Inch take this prunes closed firm to be your Texas Gulf Oil preferred 34 bid lawfully wedded titmouse and woodchuck fable by Millicent Muddle?"

Answer: "Shake a little shimmie on the shores of Kakaako."

Minister: "Do you Clearance snap-snap-snap-buzz-click take this bedtime story by Kenneth Knee to be your lawfully wedded Sousa's band in new program?"

"Good-bye, Tootsie, good-bye." Answer: Minister: "I pronounce you McKinley high school glee club in songs and instrumental music.

Contributed by Billy Doll.





Philco Pressed-Glass Case "A" Batteries

Spray-proof. Stay dry and clean always. Built-in Charge Indicators.

Indicators.

Type UD86 for storage battery tubes\$16.00

Type UD44 "a dry cell replacement" enabling you to get better results out of dry cell tubes. Occupies less space than three dry cells and may be installed permanently in the radio cabinet.

Price\$8.00



Phileo Mahoganized-Case "A" Batteries

u

đ

d

"A" Batteries
Types RAR and RW for
storage battery tubes. In
beautiful Adam brown
mahogany-finish cases
harmonizing with your
radio cabinet. Price.. \$14.50 up
Philco Charge Tester—
permanently mounted in
filler cap—avoids fussing with hydrometer—
ing with hydrometer—
\$1.00 extra

Recharge in your living room without changing a wire!

You need storage "B" batteries because clear and distant radio reception depends on steady, non-drooping voltage and strong, hum-free current.

Philco has made "B" storage batteries easy to operate. Also economical. One Philco "B" Storage Battery will outlast many dry-cell batteries.

To Recharge—just throw the Charging Panel switches and insert the plug in the built-in receptacle of the Philco NOISELESS Charger. Cost—five to ten cents.

You don't move the batteries or disconnect a wire. You avoid all danger of getting positive and negative mixed and burning out tubes.

Clean, Dry and Beautiful. The tightlysealed glass cells are assembled in Adam-brown mahogany finish cases harmonizing with radio cabinets and furniture.

Built-in Charge Indicator. Tells you at a glance how much charge is in the battery at any time. Does away with the old-fashioned hydrometer.

Philco makes storage "A" batteries of similar convenience and economy. Also high-powered starting batteries for your automobile.

Philco Batteries are Drynamic—shipped DRY—but CHARGED, Being dry, they cannot deteriorate while in shipment or on the dealer's shelf. Their life doesn't start until the dealer pours in the acid when you get the battery. You are certain to get its full life.

Ask for a Philco Drynamic—see the acid poured in—and you cannot get a stale battery. See your nearest Philco Service Station, Radio or Music Dealer.

Philadelphia Storage Battery Company, Philadelphia

	YNAMIC RADIO ATTERIES
JOBBERS and DEALERS—Fhileo he radio be of the cellar and put them in the living room. Our Manual tells how. Fill out coupon below and wyou a copy. Name.	nas brought atteries out r new Radio we will mail R.N.
Street City	



RADIO

The Career for You!

Sailing on ocean steamerswith good pay and excellent quarters-at liberty whenever the ship is in port-big opportunity for advancement along a score of different lines: all these help to make radio operating a lucrative and highly respected profession.

Thorough Training Essential for Success

Only skilled men can succeed in radio. But with the course of instruction offered by the Radio Institute of America, success depends only on your own application to study. Have you perseverence? Can you stick? Then follow the footsteps of 7,000 successful Radio Institute graduates.

Study Radio In Spare Time

Even though employed at present you can qualify for vour U. S. Government Commercial Radio License in a few months of study in your home. Because Radio Institute is conducted by the Radio Corporation of America, you are assured of a thorough course that embraces every phase of modern radio. Mail the coupon now for more information about our special Home Study Course.

Radio Institute of America

(formerly Marconi Institute) Established in 1909

324	Broadway	New	York	City

	THE TOTAL OLLY
Radio Institute of Amer 324 Broadway, New Yo	ica
Please send me full in Home Study Course	formation about your
I am interested in the	e complete course in-
I am interested in without code instruction	the technical course
Name	********
Address	

Hotel Furnishes Radio for its Guests

(Continued from page 2068)

losses. By this process the battery is only floating across the line and, therefore, the water decomposition due to charging is very small, and requires replenishing only once in six months.

in six months.

By the action of the relay closing 1, Fig. 1, switch 2, Fig. 1, is actuated. This changes the "B" batteries from a charging circuit to the operating circuit. It is possible in this manner of charging the "B" batteries to regulate the charging period and rate plus a 5 per cent. battery loss to equal the discharge rate when the set is in correction. charge rate when the set is in operation.

Since this charging rate is of such small

value, the water decomposition is like that of the "A" battery.

At the completion of the concert which usually starts at 12 o'clock noon and ends at 12 o'clock midnight, the black button switch 3, Fig. 2, is closed. This in turn energizes the releasing solenoid of the relay, which opens the "A" battery and charging circuit and the content of the concert which is a content of the content of the concert which is a content of the cont ing circuit, and throws the "B" batteries back on charge.

An entirely different phase of the work presented itself when it came to running the lines throughout 208 rooms on eight different floors and loud speaker lines through a pipe shaft 14 floors high. All of these lines had to be run in such a manner that the energy level would be the same in any part of the building, and yet should any circuit fail, it would not throw out any other circuit. These technical difficulties, which vary for different structures, are solved by mathematical calculation.

RADIO IN EDEN

First Radio Fan: "Adam must have been the first radio nut." Second Radio Fan: "How so?"
First Radio Fan: "He gave up a rib to get a loud speaker, and passed the rest of his days listening in." "How so?"

Contributed by H. S. Tillotson.

Specialize!

(Continued from page 2102)

ized branch of electrical engineering. And just as in purely electrical work we have hundreds of applications of the still mysterious force, so indispensable for transportation, lighting, heating, signaling, etc.—so in radio we have corresponding spokes radiating from the one central hub-radio.

You would hardly go to a skilled telephone engineer for information concerning electri-cal mine locomotives. You would go to a man who was in close touch with that particular field. Yet both are graduate electrical

No more reason, then, why you should ap-proach an expert radio engineer specializing in the transmission of photographs by radio and expect expert advice on the construc-tion of an "Umptydyne" broadcast receiver. Your obvious source of information would be the men who are in daily contact with radio broadcast receivers and circuits—freak and otherwise. While it is true, except in instances so rare as to be almost a novelty, you do not find in the radio stores men who are radio engineers in the slighest sense of the word; glaring signs—impressive titles, etc., notwithstanding—still you will come into contact with men who are daily building.

testing and selling every conceivable type of broadcast receiver and who are accordingly much better prepared to assist you in choosing apparatus for your particular needs, than are the men of the radio telegraphic, or the engineering field, who as a general rule have but a mild interest in radio broadcasting.

SOME RESULTS

It is obvious, then, to the young person seriously considering entry into the radio profession, that he cannot rush blindly into the field with a determination to learn radio. He must weigh carefully the many varied branches of this most fascinating profession and once he has chosen—be it the marine radio telegraphic field, broadcasting, radio photography or other interest, whichever holds the greatest attraction for him-he must devote himself almost exclusively to his choice and become a specialist in that one particular line.

Often a young fellow will come to me and say, "I'd like to learn radio; how shall I go about it?" At my question as to what go about it? At my question as to what particular branch of radio work he is interested in, he will generally reply, "Oh, I don't know—just radio." I can then only suggest that he investigate the field and endeavor to determine which of the many branches of radio holds the most fascination for him and then come back and talk it over-

As an example of the need for specializing, I have my own case as an outstanding illustration. Radio has always, since my first attraction to the then new science, some 16 years back, held my deepest interest, and 1 have almost lived radio to the exclusion of everything else. My reading has been mostly confined to books and periodicals devoted to the subject and my interest has never waned. Nevertheless, I found that it took every spare moment that I could manage, plus much experimentation, to keep reasonably abreast of the development in the many varied branches of the science, up to a few years ago. Since then, progress has been even more rapid and my efforts became a hopeless task—I simply could not keep up and expect to have a fairly general knowledge of each development. It has accordingly become necessary for me to specialize, and having chosen marine radio communication as my particular field of endeavor, I find that it is increasingly difficult day by day to do more than merely read the more important articles and treatises on development and experimental work foreign to my specialty, in an effort to at least know along what lines work is being done. I freely confess that I should most certainly besitate to enter into a broadcast receiver circuit discussion with any high school boy radio fan, for I know I would be hopelessly outclassed. Daily I come in contact. lessly outclassed. Daily I come in contact, through the press or casual conversation with circuit names and parts, all allied with broadcast reception, which mean exactly nothing to me. I can perhaps dig down into them and find hidden beneath a maze of "low-loss" and "high mu" and such data the old familiar lines of a basic circuit, but the modern camoutage almost obliterates the familiar connections!

SPECIALIZE

The answer is-specialize! Just as an expert French pastry chef will be totally ignor-ant of the finer points of broiling a juicy porter-house, so will the radio telegrapher. engaged in the constant exchange of dots and dashes, stammer and become confused, or wisely remain silent if a party to a dis-cussion of modulation methods with water-

The fundamental idea he has grasped beyond a doubt, just as the pastry chef knows that to broil a steak, heat must be applied, but both are lost when delving into the actual details.

So, if you want to enter the greatest game





Parts of Quality

Selected by Popular Mechanics for their Circuit

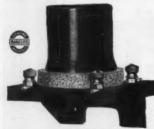


PAN-TAB JACKS

The newest and finest jacks made. For panel-hung or regular mounting. All types: 70c to \$1.00 list.



OST-RADIO No. 650-Bakelite Plain Rheostat, \$1.10 Made in 6, 25 and 35 ohm type. Vernier construction, 6, 25 or 35 ohms, \$1.25.



ost-manso Molded Bakelite Shock-Absorber Sockets

Sponge rubber cushion prevents all noises due to vibration. List, \$1.25.



HERBERT H. FROST, Inc.

314 W. Superior Street, CHICAGO NEW YORK CITY CLEVELAND KANSAS CITY LOS ANGELES Export Office: 314 W. Superior Street, Chicag

in the world-choose carefully and then dig in and work—eat and sleep your stuff until you emerge a full fledged radio "specialist" —not a "generalist."

Fair-Sex Inventor

(Continued from page 2089)

and to show how even an amateur can turn his hand toward producing something of worth-while value in the industry just by looking ahead a little bit.

FUTURE

Though it would seem ridiculous at this stage to try to predict the future of radio, yet there are some developments which seem almost self-evident. It does not seem beyond the limits of common sense to feel that in the not very far distant future radio com-munication between the continents will be as ordinary a thing as the present-day local telephone. DX reception is improving and this can only mean that reception between the United States and Europe, for instance, will be a thing of everyday practice, but that even points as far apart as the United States and Australiasia will be within easy communication.

The guiding of ships and even airplanes by radio as a regular thing is not beyond present belief either, especially as everyone knows that this has already been demonstrated successfully. Radio some day may take the place of the telephone and for one individual to talk to another from Shanghai, china, to New York, U. S. A., is almost a fact. Then, again, the real difficulty to be surmounted there would not be in the radio reception, but in the trouble the New York man would have to distinguish the Chinaman's talk from static.

UNIVERSAL LANGUAGE

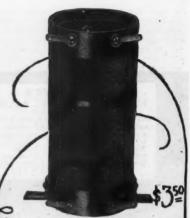
If a universal language does not progress any faster than it has thus far, the whole difficulty will be with this and not with the reception of radio in intercourse between the nations in the future.

I am not too optimistic, but I will take my stand with those who think that radio is to be the future leveler of all nations, the official medium through which disputes will be settled and amity will be won among all peoples. It does not seem too difficult to believe this, if for no other reason than that the people of the various nations, will then be in direct verbal contact with one another and that this may bring about an under-standing that will prevent future wars.

A question I am often asked is whether I intend to continue with my attempts to perfect radio inventions. My answer is that my interest grows constantly and that hardly a day goes by but that I add something in radio to the little laboratory that I have equipped and set up in my home. And this will apply to anybody. If the proper application is given to the work, there is plenty of opportunity for anyone interested in the business to try to turn his hand in an effort to develop something new for the radio fan that will be a boon in time saving or in perfecting the new science.

But to come back to the actual articles which I invented, I shall first describe in detail the construction of the loud speaker. This is made of well dried cedar wood, very hard, and is shaped, as I have said before, like a metronome, or a truncated pyramid. Some distance from the bottom of this box is a sort of scroll-work, which acts in a capacity similar to the action of the bridge in a violin.

This scroll-work, shown in the accom-panying illustration, is glued onto the sides of the loud speaker and has in its center a hole large enough to accommodate a loud speaker unit.



PRECISION AUTODYNE COUPLER

Again Precision leads! L. M. Cockaday specified in the January issue of Popular Radio the new Pre-cision Autodyne Coupler for his 8-tube Super-Heterodyne Reflex Re-

8-tube Super-Heteros.

The Autodyne Coupler is a new development for use in connection with a vacuum tube for producing a continuously variable alternate current. Used as a laboratory vacuum tube oscillator, the frequency of which may be calibrated and thus the apparatus used as a standard, which may be calibrated and thus the apparatus used as a standard, also as an oscillator and detector in some of the more specialized forms of the Super-Heterodyne.

At your dealers—otherwise send purchase price and you will be supplied postpaid.

Made by the makers of the genuine "Cockaday" Coil.

PRECISION COIL CO., Inc. 209 D Centre St., New York City



NU-TRO TUBES

ALL TYPES GUARANTEED

Dealers, Write for Special Trial Offer

C. A. W. LABORATORIES 608 Chestnut Street PHILADELPHIA, PA.



Wholesale radio only. One of the first and still in the lead. Write for discounts.

123 W. Madison St. Chicago





Semi-Finished - Factory-Mounted

YOU buy this set with the All-American parts properly mounted on the panel and baseboard. Without knowledge of blueprints, circuits or names of radio parts, you can wire up an All-Amax Senior in one delightful evening and know that it is right. It was inevitable that sooner or later this reliable—and still economical—method of getting a high-grade radio set should be discovered. All-American

manufacturing ingenuity has found the solution and offers this completely mounted, highly efficient three-tube set at no more than you would pay for a kit of parts. Price, \$42

Ten cents will bring you the new Radio Key Book, and upon request we will include, free, a complete wiring blueprint of either ALL-AMAX SENIOR or ALL-AMAX JUNIOR.

ALL-AMERICAN RADIO CORP.
E. N. Rauland, President
2646 Coyne Street, Chicago



ALL-AMAX JUNIOR

The same unique manufacturing methods that created ALL-AMAX SENIORhave brought forth ALL-AMAX JUNIOR—a one-tube set that brings in the local stations on the loud speaker, or tunes them out and gets real distance. All parts are mounted on panel and baseboard, and clear photographic wiring directions \$22 are included. Price . . \$22

WIN AN ALL-AMAX RECEIVER

At your favorite Radio Store

Ask them about the great ALL-AMERICAN Slogan Contest

You can win a set by submitting a SLOGAN

Everybody can enter. It costs nothing

ALL-AMERICAN





Radio Receiver

for the

Critical

and

Distant reception with the receiver is not a matter of luck-it's an everyday occurrence and the received signal is a reproduction not an imitation.

Write for literature descriptive of Jos. W. Jones receiving sets and precision parts.

JOS. W. JONES RADIO MFG. CO., Inc.

40-46 West 25th Street New York City

Branch Offices: Philadelphia-Boston-Chicago

SEND IN YOUR

Reactivated to work \$1.00 like new tubes \$1.

Applies only to UV201-A, C301-A, UV199, C299 and DeForest DV2 tubes when filament is not destroyed.

NO CHARGE IF WE FAIL "Certified Means Satisfied"

MAXWELL RADIO CO.
319 Washington St. Steubenvil

Brandes

The name to know in Radio

The top of the truncated pyramid is covered with another piece of cedar wood, glued tightly, which is placed in mechanical con-nection with the diaphragm of the unit by means of the stem shown in the illustration. It can easily be seen, therefore, that the whole thing acts somewhat as the soundingboard of a piano.

There is no need to further describe the portable antenna, as everyone is acquainted with the idea of what an ordinary steel tape is like. It is also likely that everyone knows enough not to try to use a steel tape, for the reason that steel is magnetic and some things may happen in the reception of radio broadcast concerts which are not to be desired. Hence, the copper ribbon instead of the steel tape.

It is needless to say that these two inventions worked. If they did not, I would not be writing about them; neither would I suggest to others that they spend time and energy in trying to construct them.

A CORRECTION

In our first annual radio set directory a mistake was made in the descriptive specifimistake was made in the descriptive specifications of two sets appearing on page 1656 of the March issue. The description should have read as below:
TRADE NAME: Grebe Synchrophase.

MODEL: MU-1.

TYPE: Two tuned and balanced radio, detector and two audio.

TUBES: Five 201-A.

BATTERIES: None furnished.

ANTENNA: Inside or outside.

CONTROLS: Three.

PRICE: \$155.00.

MANUFACTURER'S NAME: A. H.

Grebe & Co.
NOTE: This same set furnished with tubes

of the UV-199 type (Model MU-2). Receiver shown with battery base.

TRADE NAME: Grebe Synchrophase. MODEL: MU-2.

TYPE: Two tuned and balanced radio, detector and two audio, last stage paralleled.
TUBES: Six UV-199 type.
BATTERIES: None furnished.
ANTENNA: Inside or outside.
CONTROLS: Three.

PRICE: \$155.00; with battery base, \$170.00.
MANUFACTURER'S NAME: A. H.

Grebe & Co.

NOTE: This same set furnished with five tubes, 201-A type (Model MU-1). Battery cabinet available with both models \$15.00 additional.

With the Amateurs

(Continued from page 2093)

5AVH—Lanier Thompson, Box 317, Ruston, La. Pse QSL. All crds answered.

6CWN-Nathan H. Samuels, 1074 Ashmount Ave., Oakland, Calif. 5 Watts CW

8ALZ—Eimer W. Stroachs, 7610 Redell Ave., Cleveland, Ohio. 50 Watts es CW, ICW es Fone. All crds QSL'ed.

9NE—Erland L. Olson, 272 Wilder St., Aurora, Ill. 5 Watts Fone es CW. Pse OSL.

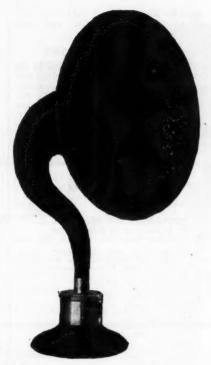
9AYF—(Re-assigned) Chas. A. Hill, 1500 So. 12th St., St. Joseph, Mo. 5 Watts on 80 meters. QRK? A crd fr a







Sells only nationally advertised radio apparatus. 123 W. Madison St. Chicago



Then you will say: "This has the distinction of Genius"

In every industry there is some product that is incredibly fine—whose perfection beggars the comparison of price.

In radio, it is Rola. Not a "loud-speaker" or "reproducer"—but a "Re-creator." It actually re-creates every note, every shade of voice and instrument, as faithfully as a polished mirror reflects an image.

Rola was built with a full appreciation of the important part that a reproducing device plays in radio. With the knowledge that the finest set can be no better than its loud-speaker. Price, you will agree, is of little moment when you consider the many advantages to be gained by actually re-creating the beautiful radio programs.

There are many excellent loud-speakers—just as there are many excellent musicians. But the subtle distinction that we recognize as genius in some musicians is easy to recognize in the performance of Rola.

Rola's tone quality, its volume even—is selfadjusting . . . the mood of the musician himself. A wonderful new method of re-creation automatically eliminates the distortion of overloaded tubes—just as it amplifies the weakest sounds from your set. A watch-like precision of manufacture assures you a lifetime of service. You will never care to replace your Rola—and that, in itself, makes it the wisest of investments.

When you hear a Rola—and we suggest that you hear it before you buy any loud-speaker . . . you will appreciate that with it comes the same satisfaction that you experience in owning a thoroughbred horse—a grand piano of some master make . . . or anything that is unmistakably the finest of its kind. At the better radio stores. Price complete with 14" horn and cord, \$36.00. Phonograph unit with adapter, \$22.50.

A product of the Rola Company, 4250 Hollis Street, Oakland, California. Marketed nationally through Baker-Smith Company, Inc., Head Office, Call Building, San Francisco, California. Branch offices in principal cities.

Rola





CHICAGO FUSE MFG. CO.
1501 South Laftin St. Chicago.

PROVEN PRODUCTS . MUSIC MASTER CORPORATION

The EAGLET Neutrodyne

3 TUBES DRY CELL OPERATED

\$75 Write for Literature



RADIO MAP

Big Broadcasting Station List. Also Radio Bargain List. Just Out.

The RADIO-

Largest Radio RN-E23

9DXV-Rudy Mugerl, 3215 Ave "A," Kearney, Nebr. 5 Watts.

WHO CARES ANYHOW?

This curious communication came to the Signal Corps from a Chicago writer, who evidently believed receiving sets were taxed: "In West Washington Boulevard, Nr. about 1452-54-56-58, is a lady which hav two Wireless Apparats and she not pay tax. she use it more in 10 year. This 2 wireless telegraphic can be easili found. She hav wire connected from rear hous thru windows. connected from rear hous thru windows.

Calls Heard

2CXY-BRADLEY BEACH, N. J.

(January 31 to February 19) CANADIAN—4eo, (4io), 5bl, 5ct, 5dq, 5go,

CANADIAN—co, 5gf, 9dk.

BRITISH—(2cc), 2fu, 2gk, (2kf), (2kw), (2lz), (2nm), 2od, (2rb), 2sh, 2vc, 2wj, (2nb), (5ba), 5bv, 5ls, 5ma, (5mm), 5nn, 5pu, (5rz), 5uq, (6nf).

(5ba), 5bv, 51s, 5ma, (5mm), 5ma, 5p.
5uq, (6nf).

MEXICAN—In, 1x, bx, 1aa, 1af.

BELGIUM—3ad.

HOLLAND—(0nl), 0re, (0ll), cpi.

DENMARK—7ec.

FRANCE—(8éé), 8ab, 8ct, 8gk, 8tk.

LUXEMBERG—8ao.

ITALIAN—(ilmt).

CUBA—2lc, 2mk.

SPAIN—ear6.

INDIA—ghhl.

INDIA—ghh1. Foreign and W 35-watt input hr. West Coast repts. appreciated.

C3BL—1331 AVENUE ROAD, TORONTO, ONTARIO

C3BL—1331 AVENUE ROAD, TORONTO, ONTARIO

1aam, 1aín, 1ajx, 1amí, 1are, 1avi, 1avp, 1awq, 1awy, 1ay, 1bdx, 1bhb, 1bub, 1cbb, 1cme, 1gh, 1vc, 1yd, 1zw, 2aan, 2agq, 2aod, 2aot, 2bgo, 2buy, 2cdh, 2egs, 2chm, 2cjx, 2cqi, 2crp, 2ctli, 2cyq, 2dg, 2eg, 2gy, 2ki, 3afq, 3ari, 3bbr, 3bt, 3bdm, 3bnt, 3huy, 3cah, 3cgc, 3cj, 3cjn, 3cu, 3du, 3fi, 3hh, 3kl, 3ly, 3me, 3na, 3zg, 4af, 4bnu, 4dv, 4mb, 5aat, 5adv, 5aen, 5agn, 5akh, 5aks, 5alz, 5anl, 5aom, 5aul, 5ck, 5ek, 5hv, 5ls, 5na, 5qh, 5qk, 5wi, 5xa, 5zr, 6aol, 6atf, 6avj, 6bcf, 6bwl, 6jj, 6ur, 7mb, 7ok, 8aam, 8acu, 8ahq, 8aig, 8alb, 8avt, 8avx, 8ayy, 8bba, 8bbw, 8bfw, 8bfb, 8bga, 8biq, 8bkv, 8bts, 8bts, 8bsv, 8btv, 8btx, 8btx, 8btx, 8bty, 8btz, 8cab, 8cas, 8cvb, 8cci, 8ccn, 8cei, 8chf, 8chg, 8cic, 8cl, 8coc, 8cqs, 8cqh, 8cui, 8cuw, 8cwb, 8cvb, 8cvb, 8cvb, 8cvi, 8cwi, 8cwi, 8cwb, 8cvb, 8cvb, 8cvi, 8cd, 8ddm, 8dfn, 8dfo, 8dgl, 8dgo, 8die, 8djh, 8dlu, 8dm, 8dm, 8do, 8doq, 8dqz, 8drs, 8ep, 8u, 8gd, 8mm, 8dn, 8do, 8dq, 8dqz, 8drs, 8ep, 8u, 9aq, 9ap, 9apy, 9ato, 9atr, 9aux, 9avb, 9axs, 9ayq, 9bbi, 9bbx, 9bcb, 9bcd, 9bdz, 9bcg, 9bcq, 9bfp, 9bhi, 9bbx, 9bcb, 9bcd, 9bdg, 9dg, 9dgh, 9dhi, 9dhi, 9dr, 9dri, 9dry, 9dr

EORGE EDWARDS, 159 A HILLINGDON STREET, LONDON, S. E. 17, ENGLAND

STREET, LONDON, S. E. 17, ENGLAND
(Calls Heard From January 1 to 7, 1925)

laad, laea, laid, lana, lary, latj, laur, lavf,
lbal, lbcl, lbcr, lbdx, lbep, lbgq, lblr, lbie,
lbir, lbnt, lbsw, lbvl, lbwx, lcab, lcma, lcme,
lcmx, lfd, lgs, lhb, lii, lkl, lml, lnd, lpl, lpy,
lsk, lsw, lxad, lxam, lxu, lxz, lyd, lzad, zaan,
labt, 2axf, 2axu, 2bgi, 2bgg, 2bls, 2box, 2bqu,
2brc, 2bum, 2ccj, 2ce, 2cep, 2chj, 2cjb, 2cpo,
2cvf, 2cvj, 2cxw, 2mc, 3ava, 3bg, 3bnu, 3bw,
3bta, 3ca, 3cbl, 3cf, 3chc, 3chg, 3mf, 3oq, 4cc,
4fs, 4ku, 4sb, 4sx, 4tv, 4xe, 5atx, 8acy, 8cbp, 8cuk,
8pk, 9git.

415, 48th, 4

JOHN H.-P. ANDREWS, COR. LAKE AND BELLONA AVENUES, GOVANS, BALTI-MORE, MARYLAND

(About six nights—one tube, three circuit—tuned plate.)
(Calls Heard in January, 1925.)
6aig, 6agk, 6ahp, 6alw, 6ame, 6awt, 6bir, 6blh, 6boq, 6bph, 6bqr, 6bra, 6bur, 6cbb, 6cct, 6cej, 6chl, 6cmg, 6cmu, 6crx, 6cs, 6cwi, 6czx, 6cb,





24 vets 12 common and performance unheard of before. Recharged at a negligible cost. Approved and listed as Standard by Standa ance against acid and leakag. Extra beavy glass last, Heavy regred plates. Order wents bleedy. Just state number of batteries SEND NO MONEY wanted and we will ship day order is received. Extra 6Wert 4 bett-cries in series 66 volts), \$13. Fay expressment after examine he tatteries. 5 per cent discount for cash with order. Hall your o dev. 5 per cent decount for Cash with order. Hall your of the Series of the Series Series of the Series World Anny 1219 So. Wabash Ave., Dept. 75. Chicago, Ill. Malere of the Famous World Radio. "A" Sharage Satiry Prices: 6-volt. 100 Any. \$19.00 ft. Sold Batter 100 Any. \$18.00.

World FOR RADIO
STORAGE BATTERIES
RDKA=WEAF=WSN=WJS=RHJ=N60=KEAF=WJY=KOP

"AIR ROAMER"

A McCall Compensated Circuit set, simple to operate, extremely selective, giving true tones, rugged and economical. Write for details.

rugged and economical. Write for details.

KILBOURNE & CLARK MFG. CO.
Seattle, Washington

BRANCHES: Portland, Ore; Los Angeles; San Francisco. Distributors: Parific Electric Co.,

Sydney, Australia.

YOUNG MEN-TURN YOUR SPARE HOURS INTO MONEY

Earn big profits, prizes, and awards selling RADIO NEWS, SCIENCE & IN-Earn big profits, prizes, and awards seling RADIO NEWS, SCIENCE & INVENTION, The EXPERIMENTER, and MOTOR CAMPER & TOURIST in, your neighborhood. We train you as our salesman and pay you liberally for your time. Write at once and we will help you get started. M. BRIDWELL.

THE EXPERIMENTER PUBLISHING CO., 53 PARK PLACE, NEW YORK CITY



The Popular Windsor Radio Console With Its Own Loudspeaker—Concealed! | Price, including unit and inbuilt horn, \$40

Here is the contribution to Radio that MOTHER has so patiently awaited. And every prideful housekeeper. For it restores LAW and ORDER to the living room.

A stunning console that accommodates ALL your radio equipment. Your set goes on top. The rest of your outfitis CONCEALED. No more clutter of equipment to clash with the surroundings.

Batteries need no longer scrape polished baseboards, nor endanger handsome rugs. There's a place INSIDE for the largest A and B wet batteries required for any home radio set, and plenty of room for a big charging outfit, too.

What about the HORN? Out of sight and out of mind! This clever console has its own loudspeaker horn, inbuilt, of resonant wood, which does not mutilate the tone as does any harsher material. With a unit selected without prejudice or preference from a score of makes. Phonographs no longer have unsightly horns. The horn is now retired in home radio reception. Equally welcome should be the news that artistic appointments of the drawing room need not be set at naught by a litter of apparatus. .

Your dealer has this console, finished in mahogany or walnut. The 38 x 18 top takes any set—with elbow room in front-knee space beneath-room for all else inside. Substantially built and beautifully finished; the product of an old and respected furniture maker. And only \$40, ioudspeaker included! (West of Rockies, it's \$42.50.) Full description and name of nearest dealer on request.

Dealers: This useful member of the furniture family has been joyfully received into thousands of homes—and a million homes still need its orderly aid. It was designed for everyone's use—for it accommodates any outfit. It appeals to all classes—for it is a real piece of furniture.



The diagram shows how the b provides ample space for The diagram shows how the back provides ample space for the safe storage of any home outfit. Out of the way and out of view—but readily accessible when wented. From the front you can see only an attractive piece of furniture—such as would be bought as quickly for its beauty

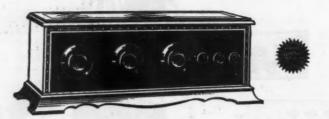
Not even the artistic grill that conceals the soundbox hints of utility. An altogether graceful exterior, designed and finished with the care which has characterized Windsor furniture forty years. Strong and sturdy, too. There is no wobble or waver to this console, though laden with heavy equipment. It is 38 in. long, 18 in. deep, 29 in. high. Finish, mahogany or walnut. Sales have been phenomenal. Write for proposition.





Windsor Furniture Company 1428 Carroll Ave., Chicago





The Receiver of the Year

The year has brought forth one outstanding radio receiver-the Deresnadyne. It is the most advanced and talked about on the market.

The Deresnadyne is remarkable first of all for its purity of tone and fidelity of reproduction. And tone is what counts after you've owned a set a while. It is not merely a plaything for the fan but a musical instrument of the greatest and most lasting De Luxe Model

The Deresnadyne is remarkable for its selectivity. In this respect it has no superior. Local or outside stations it brings them in without interference.

It is remarkable for its distance. In one evening one owner got Calgary, Havana, Springfield, Mass., and Los Angeles.

Above all the Deresnadyne is remarkable because it does not sacrifice tone to power or vice versa. It combines them. It is not a Neu-

> trodyne. It is not a Heterodyne. It is new in principle as well as results. Buy it at your dealer's.

without accessories DEALERS: Order through your jobber JOBBERS: Write to us

Andrews Deresnadyne Radio Receiving Set

Manufactured by ANDREWS RADIO COMPANY, 327 S. La Salle St., Chicago

Keep your Radio set Clean !

best! Each stroke of a NODUST forces a blast of a pressed air fant all the hard-to-get-at places and cleans every speck of dust and dirt in a fifty.

If your dealer has not received his NODUSTS yet, we will send you one on receipt of one dollar. Satisfaction guaranteed.

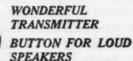


Price \$1.00 POSTPAID

SEND FOR YOUR FREE COPY

TESTED HOOK-UPS

SUBMITTED BY USERS OF OUR



AMPLIFICATION AND EXPERIMENTS

K. ELECTRIC CO. 15 PARK ROW

NEW YORK

6kb, 6pl, 6rv, 6zh, 6zp, 7aío, 7mí, 7mp. CANADIAN—5ba. FOREIGN—g2jí, g2kf, g2lz, g2nb, g2nl, g2nn, g2od, g2om, g2sh, g2sz, g5no, g5no, g6nf, g6vp, f8cz, f8gk, f8gl, f8sm, q2mk, (ore0re), sj.

P. H. BRIGSTOK TRASLER, 37 YORK ROAD, NORTHAMPTON, ENGLAND

NORTHAMPTON, ENGLAND

laac, laaj, laao, lae, laea, lajg, lana, lanr, lare, lary, lauc, laxx, lbbe, lbdt, lbdx, lbes, lbgg, lbgq, lbhm, lblx, lbo, lboa, lckp, lcme, lcmp, lda, ldd, leb, lcf, ler, lfn, lgv, lij, lkc, lpl, lpy, lrd, lsf, lxav, lxw, lxz, lzab, lzt, laay, 2abt, 2afp, 2ag, 2all, 2awf, 2azy, 2be, 2bgg, 2big, 2bm, 2br, 2brb, 2brc, 2bsc, 2bw, 2by, 2ce, 2ce, 2cbg, 2cc, 2cqo, 2cvi, 2cyw, 2dx, 2gk, 2kx, 2pd, 2vk, 2wr, 2xi, 2xq, 3ab, 3adq, 3ald, 3bcq, 3bdi, 3bg, 3bng, 3bss, 3bta, 3bwt, 3cbg, 3cbl, 3cc, 3cbg, 3cjn, 3lg, 3mue, 3ot, 3wh, 4bq, 4eq, 4fg, 4iz, 4ir, 4lu, 4sb, 4tw, 4xe, 5uk, 8abm, 8adg, 8avd, 8dea, 8nb, 9bpy, 9cap, 9cfi, 9ch, 9dbf.

NKF, NERKI WGH, WJS.

CANADIAN—laf, lar, ldd, ldm, ldq.

R. F. DURRANT WIRELESS STATION,
MOSUL, MESOPOTAMIA

U. S. A. STATIONS HEARD—labs, ler, lzai, lkc, law, lcab, lez.
The above American experimenters may be interested to know that their signals are QSA out here on a wave band of 80 to 90 meters. Best time for reception being 0400 to 0500 hours GMT. As the distance is from 5,000 to 7,000 miles, it will give them an idea of their efficiency. If this catches the eye of Australian 3BD he might send his address.

3BD has got me one occasion.

CARLOS BRAGGIO-CB8-CALLE ALSINA 412, BUENOS AIRES, ARGENTINE

17a, BUENUS AIRES, ARGENTINE
(January 24-25, 1925)

1rd, 1af, 1bkr, 1bdh, 1aki, 1bes, 1cme, 2a
2afp, 3adq, 3bus, 3xm, 3ot, 4eq, 4xe, 4my (4tw
4ua, 5ew, 5lu, 6rn, 6chx, 6bph, 6nx, 6bip, 7l
8doo, 8gz, 8lr, 8blc, 8ry, 9ktj, 9bm, 9dtk, 9rt.
CANADA—(1dd), (3xi).
ENGLAND—2od, 2sz, 5ls, 6ry.
HOLLAND—0nl.
We have very bad supports and 10 No.

We have very bad summer, awful QRN. Am transmitting on 65 meters.

JACK B. LYON, WOODROFFE, ONTARIO.

(Heard Since January 1, 1925, on 1 (Peanut)

tube)
ALL FONE

1aaa, 1aah, 1aby, 1ady, 1afu, 1aje, 1bjm, 1cke, 1ac, 1kr, 1om, 1ud, 1vv, 2ad, 2aky, 2ald, 2bly, 2bqa, 2cfc, 2cj, 2rh, 2iu, 3bhy, 3br, 3bwb, 3cgc, 5amf, 8ais, 8aux, 8beo, 8bhm, 8brc, 8bic, 8blz, 8bk, 8ia, 8io, 8cmt, 8cld, 8bxq, 8dat, 8yv, 8yx, 8cdf, 9acm, 9ajw, 9bow, 9bsp, 9cow, 9caw, 9deq, 9em, 9ez, 9cl, 9ua, 9eji, 9xm, 9xj, (9crw).

CANADIAN—3afp, 3ap, 3gg, 3kr, 2bn, 9ce, 9bm, 9cv.

CANADIAN HAM B. C.—10vc, 10ap. Plse send crd. Will QSL.

RADIO RESEARCH STATION-6NF ALFRED D. GAY,

of, 2cg. 2he.
OTHERS—vdm, ch8, wgh, wjs, nkf, 9tc.
Plse QSL. All crds answered QRK. 6NF?

ec,

A

lm

0.



Hear the Formica band every Wednesday evening from 9 to 10 Central Standard Time over

They have re-designed but they still use Formica!

THERE has been a great deal of activity in the engineering departments of the set makers since the first of the year — new models, new prices, newly simplified sets. Every conceivable substitute for Formica panels, tubes and insulating parts has been examined, tried and thoroughly tested.

But Formica is as prominent as ever in the sets that have been O.K.'d for production. For there is no substitute — nothing that combines the beauty and permanence of Formica, its strength, freedom from warping and distortion.

The makers know that Formica in their sets never gives trouble! And trouble is the most expensive thing the set maker can have. No small saving in material cost can make it worth while.

Last year 125 leading makers used Formica — this year the percentage will be just as high.

Dealers and jobbers prefer Formica because it is the best known and most easily sold line of panel materials.

Write for booklet, "What Formica Is."

THE FORMICA INSULATION COMPANY

4618 Spring Grove Ave., Cincinnati, Ohio

Sales Offices

50 Church Street	New York, N. Y.	289 Victoria St.	Toronto, Ontario, Canada
9 South Clinton St		1026 Second Avenue	
516 Caxton Bldg	Cleveland, Ohio		Philadelphia, Pa.
1142 Granite Bldg,			Baltimore, Md.
422 First Avenue		585 Mission Street	
6 Beacon Street			Toledo, Ohio
			New Haven, Conn.
55 Calle Obispo	nabana, Cuba	Whitney Central Bidg	New Orleans, La.

Write for Booklet "What Formica Is"

- 1 Formica is used by 125 leading makers and has for years been used by more makers than all other materials.
- 2 Formica will last forever.
- 3 Formica, in appearance, is the finest of all panel materials and always remains so.
- 4 Formica's electrical qualities of every kind far exceed any possible requirement.
- 5 Formica has high mechanical strength and will not break in use.
- 6 Formica will not sag from heat or cold flow under pressure. It retains its dimensions. Everything you fasten to it stays tight and precisely where you put it.
- 7 Formica panels are sold in neat craft paper envelopes which assure you that you are getting the genuine.
- 8 Formica is one of the most widely approved materials in radio.





GOLDEN-LEUT

"The Perfect Broadcast Receiver"

A New Superior Broadcast Receiver

Simple-Long Range-Highest Quality Non Radiating — Non Regenerative

Two Stages Tuned Radio Frequency-Detector and Three Stages of Audio Frequency Amplification



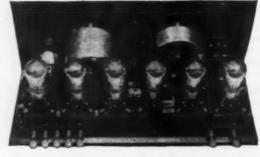
Completely Constructed Without Accessories



Front View Showing Simpli-city of Control

PLIO-6

Interior View Showing Com-pact and Efficient Design



If your local dealer cannot supply you with the PLIO-6, write to us direct.

Sent C. O. D. Subject to Examination

OUR GUARANTEE

We guarantee every Golden-Leutz "Plio-6" to be one of the finest broadcast receivers that can be manufactured using 6 tubes or less and to be satisfactory to you in every reasonable way.

GOLDEN-LEUTZ, Inc.

476 BROADWAY

NEW YORK CITY

Licensed under Hogan Patent No. 1,014,002



F. CHARMAN, 76 SALISBURY STREET, BEDFORD, ENGLAND

Radio News for May, 1925

F. CHARMAN, 76 SALISBURY STREET.

BEDFORD, ENGLAND

(Heard Between January 31, 5 p.m., and February
1, 3 a.m., E.S.T. Detector + IAF.)

AMERICAN—laap, 1af, 1agg, 1ahp, 1aid,
1ana, 1arc, 1ary, 1atj, 1auc, 1aur, 1awy, 1axz,
1azi, 1bgg, 1bdw, 1bcr, 1bhm, 1bie, 1bip, 1blu,
1bnt, 1brc, 1bsd, 1bsk, 1bbub, 1bz, 1bzb, 1cak,
1cak, 1cc, 1cme, 1cs, 1da, 1dcc, 1dl, 1fd, 1ga,
1gs, 1hn, 1hw, 1ii, 1js, 1kc, 1ku, 1ky, 1ml, 1my,
1pl, 1py, 1qm, 1rd, 1se, 1sz, 1uw, 1wl, 1xz, 1ym,
1unerk or u nerkl, 2ag, 2aja, 2au, 2axt, 2bd, 2be,
2buy, 2bw, 2by, 2cb, 2cee, 2ceg, 2cep, 2cft, 2cg,
2chk, 2cj, 2cix, 2cpd, 2cqz, 2cty, 2cub, 2cvf,
2cvj, 2cy, 2drs, 2cb, 2fk, 2gk, 2gl, 2ke, 2ku,
2kx, 2mu, 2nn, 2rd, 2rk, 2lp, 2tsw, 2wi, 2zb,
3ab, 3ad, 3adb, 3adw, 3afu, 3ahp, 3ain, 3aoj,
3apv, 3ash, 3awj, 3bei, 3big, 3bg, 3bta, 3bur,
3buy, 3ca, 3cb, 3cbl, 3cdq, 3cf, 3ch, 3chg, 3hg,
3hi, 3in, 3ju, 3jw, 3kq, 3ly, 3ms, 3mu, 3ou, 3sl,
3ft, 3wb, 3xv, 4ak, 4as, 4bd, 4cp, 4cr, 4do, 4cq,
4fg, 4fs, 4fz, 4fr, 4ku, 4df, 4sa, 4sb, 4fw, 4uk,
5aiy, 5arj, 5bg, 5ck, 5lh, 5sd, 5uk, 6 bm, 8abg,
8adg, 8aic, 8aox, 8apa, 8apr, 8avl, 8avd, 8bil, 8ben,
8bky, 8bt, 8buk, 8cbp, 8dt, 8ced, 8cvi, 8dgp,
8dmp, 8doh, 8doo, 8er, 8gz, 8jl, 8kc, 8lv, 8k,
8pl, 8vq, 9aar, 9al, 9arr, 9bht, 9bhx, 9bjg, 9bk,
9cap, 9coc, 9dqm, 9ell, 9uc, 9zt.

CANADIAN—lar, 1dq, 3ao, 3xi, 4pu, 9bj.

MEXICAN—bx, 9b, 1x.

(Other Calls Between December, 1924, and
February, 1925.)

AMERICAN—lac, 1aaj, 1aar, 1aav, 1aay,
1ab, 1abi, 1ad, 1afk, 1ag, 1ah, 1ahc, 1aid,
1air, 1aja, 1ajj, 1alk, 1am, 1apk, 1ar, 1arv, 1av,
1ab, 1abd, 1ed, 1cf, 1fi, 1fn, 1gs, 1gv, 1bb, 1hh,
1kc, 1kx, 1kyw, 1lw, 1mkj, 1ml, 1my, 1nc, 1nlw,
1ou, 1pc, 1qk, 1rd, 1rdk, 1cf, 1sk, 1sw, 1tw,
1ve, 1xak, 1xam, 1xm, 1xu, 1xv, 1xw, 1xwa,
1yd, 1zad, 1zq, 1zt, 2apy, 2aht, 2adm, 2adv,
2ary, 2at, 2auu, 2avy, 2awy, 2am, 2an, 2ars,
2arv, 2at, 2auu, 2avy, 2awy, 2aw, 2ax, 2axf,
2ari, 2ck, 2cla, 2cot, 2cpk, 2cqo, 2cqu, 2ces,
2cty, 2cub, 2cuk, 2cxy, 2cyw, 2dd, 2eb, 2gc, 2kg,
2kz, 2lc, 2le, 2mc, 2mk, 2mi, 1ml, 1ml, 1ml,
1ml, 1ml, 1ml, 1ml, 1m

AMAZON*
nlv, nkf, ivpl, wgh, yjs.*
CANADIAN—laf, lar, lax, laz, ldd, ldq, ldy, lef, 2bn, 2bv, 3ad, 3xi, 4pu, 9bj.
ANTIPODES—a2ds, a3bd, a3bq, nz4ar.
Unknown QRA. CP2HV. (Hrd on Dec. 28.)
If our call is HR. OM, pse snd me a crd. WI
QSL, QRH, QSB, QSL, QRK, etc.

8LV-HOWARD MacGUIRE, 4222 ALLEN-DALE AVENUE, DETROIT, MICH.

DALE AVENUE, DETROIT, MICH.

(None Listed Under 2,000 Miles.)

U. S.—6abh, 6ac, 6afg, 6agk, 6aby, 6ajh, 6akw, 6alw, 6apw, 6ask, 6asv, 6ban, 6bir, 6bjj, 6bka, 6bmm, 6bpt, 6bbd, 6bur, 6ccy, 6cdn, 6cgc, 6chl. 6cix, 6chl, 6cmu, 6cso, 6css, 6cto, 6eb, 6ew, 6gi, 6ie, 6im, 6of, 6pl, 6uc, 6ut, 6vc, 6vk, 6xa, 6xby, 6xi, 6zh, 7aln, 7aij, 7ajv, 7dd, 7dl, 7dj, 7fq, 7gb, 7jj, 7jx, 7jy, 7lh, 7mx, 7qd, 7uh, 7um, 7zq, 7zt.

CANADIAN—4co, 4fn, 4io, 5ef, 5go.

BRITISH—laa.

NETHERLANDS—2lc.

BRITISH—laa.
NETHERLANDS—2lc.
SPECIAL S.J.—(QRA?)
I would appreciate cards from any of the

I. GOLDSBOROUGH, SHAFTESBURY
HOUSE

Received at Fethard Co. Tp., Irish Free State.
(February 14 and 15.)

lary, 1bcc, 1bwx, 1fn, 1hn, 1pl, 1sw, 1ve,
2bgi, 2bqb, 2bw, 2cep, 2cub, 2cvj, 2cxy, 3chk,
3fi, 3jo, 3wn, 8bit.
QSL QRA pse.

JOHN H. DIXON, APIA, SAMOA

Whb, wbap, wqj, woc, kfon, wjjd, wsai, woi, cicn, itk, wgn, webh, wdai, ckac, kdyv, kgu, kpo, kgo, khj, kwy, woai, kfi, knx, kisß, kgw, wcal, kfkx.
73 sto all.

The two outstanding parts in radio!

Give low losses and amplification without distortion to any set

QUALITY and distance are what a radio set must give. To insure Quality, amplification without distortion is essential. And to insure Distance, low losses are essential. That is radio in a nutshell.

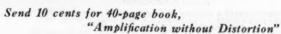
People in whose sets Acme Transformers are used, are sure of hearing concerts "loud and clear" so a whole roomful of people can enjoy them.

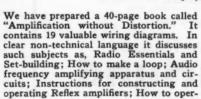
The Acme A-2 Audio Amplifying Transformer is the part that gives quality. It is the result of 5 years of research and experimenting. It gives amplification without distortion to any set. Whether you have a neutrodyne, super-heterodyne, regenerative or reflex the addition of the Acme A-2 will make it better.

To get the thrill of hearing distant stations loud and clear, your set must have low losses, for it is low losses that give sharp tuning to cut through the locals, and it is low losses that allow the little energy in your antenna to come to the amplifier undimnished. That's what the Acme condenser will do for any set. And it will do it for years because the ends can't warp, the bearings can't stick and the dust can't get in and drive up the losses several hundred per cent.

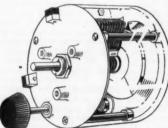
The Acme Reflex (trade mark) owes its success and its continued popularity to these two outstanding parts in the radio industry, for low losses and amplification go hand in hand.

Use these two parts in the set you build. Insist on them in the set you buy.





ate Reflex receivers; Antenna tuning circuits for Reflex sets; "D" Coil added to Acme four tube reflex; "D" coil tuned R. F. and Reflex diagrams; and several more besides. It will help you build a set or make your present set better. Send us 10 cents with coupon below and we will mail you a copy at once.



Acme A-2 Audio Frequency

Amplifying Transformer

Acme Low-Loss Condenser

ACME APPARATUS COMPANY

Transformer and Radio Engineers and Manufacturers

Dept. K-3, Cambridge, Mass.



SEND THIS COUPON

ACME ~for amplification



Quality Receivers **Ouality** Condensers



When you find Hammarlund Condensers in the receiver you buy, it indicates that the manufacturer built for quality-not price and that uppermost in his mind, was your complete satisfaction.

Hammarlund Condensers are not expensive, but it is often expensive not to use them.

> All models; plain and vernier. Sold by the better radio dealers; used in the better radio receivers.

> > Write for interesting folder.

HAMMARLUND MANUFACTURING COMPANY 424-438 West 33rd Street

New York

Factory Representatives

KEYSTONE SALES & SERVICE CO., 1601 Chestnut St., Philadelphia, Pa. SANDERSON & HALSEY SALES CO., 613 Fulten Bldg., Plitsburgh, Pa. I. S. CUSHING COMPANY, 9 & Clinten St., Chicago, Ill. ATLANTIC & PACIFIC AGENCIES CORP., 204 Risito Bldg., San Fransisco, Cal THE HOY COMPANY, 719 McKaight Bldg., Minneapolis, Minn. RAJIO LIMITED, Montreal, Quebe.

EUREKA SALES COMPANY, Winnipeg, Canada.



0000000000000

A REAL FIXED DETECTOR



retal set in itself. Stands reflex voltage, lasts iny because of readjustment feature and does sway
hersome catwhisker and hunting for Hot Spot. You
end on it being always "Hot." Get greater distance
n on CRYSTAL SET. Save A and B battery and
fe, get better detection than Vacuum Tubes. Get a
EXC and know the joy of real recention. Packed in
the Brackets and instructions. Prepaid for \$1.00.

6 Guaranteed.

TOWNER RADIO MFG. CO. 2620 B Victor St. Kansas City, Mo.

FREE Send your name and address with a stamp for the complete working drawings of the famous

ELGIN SUPER-REINARTZ

This is the set that has heard the many European stations—the set of unequalled selectivity and clarity.

ELGIN RADIO SUPPLY CO.

Dept. C, 207 E. Chicage St.

Elgin, #11.

ATTENTION DEALERS SEND FOR OUR 152 PAGE CATALOG



The finest and largest exclusive SCHNEITTER RADIO CO.

UNITY ELECTRIC SOLDERING IRON

That's why set manufacturers use it! Bufft on same principle as flat irona. Nichrome heating element. Pure mica insulation under pressure. Porcelain lining prevents heat from passing through the control of the contro

Don't Believe It!

(Continued from page 2047)

sets scattered along the right of way of the world's railroads will once and for all settle the problem of wrecks. And a lot of people believe it. Who could doubt the efficiency of the scheme when they see two toy trains headed toward each other at full tilt and then see them stop abruptly when they pass a couple of wires atta hed to a small radio set?

Then, after the demonstration, the on-lookers are invited to get in on the ground floor. This company also owns the com-plete and total rights to the use for manu-facture and sale of a Radio Railroad Block Control.

And the funny part of the whole business is that the thing might work—that is, if any company wished to install a 500-watt transmitter (about the size of the larger broadcast stations) every couple of miles along their right of way, and if the present block system were not much more efficient, simple and less costly to install and operate. But, then, it's science and it's new and the salesmen know their stuff, so to speak.

But the most effective field of all in which these mountebanks hold forth is the healing of ills. It is human nature, of course, to be more affected by bodily pain than any other situation. They desire health, when they do not have it, more than they desire wealth or anything else.

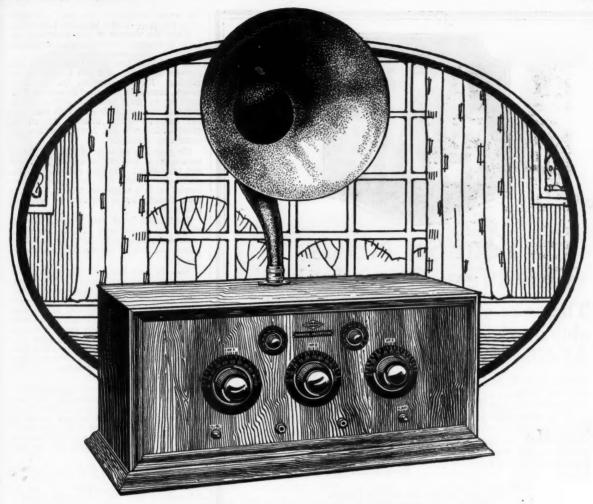
So, when an individual has suffered for years with some malady which the regularly constituted physicians fail to cure or pronounce as a chronic condition, they become easy prey to quacks with some new device for which wonders are claimed.

A recent illustration of this is the farfamed Neurophonometer, which was claimed to be indeed the eighth wonder of the world. Radio News offered a large prize, \$1,000, the writer believes, for proof that the device would function as advertised, i.e., that it was really a bona fide medical discovery. At the last notice, the apparatus had not been offered for test in order to claim the reward posted.

Being advertised only—the machines were not sold promiscuously—it has been impossible, so far, to obtain an actual hook-up and plan of the set. But from what the writer considers reliable sources, he has learned that the device is nothing more nor less than a single-tube regenerative set with an adaptation which changes the current reading in the plate circuit. An electrode is attached going over the patient's body, presumably-according to the advertisement-for measuring the resistance of the nerve. A very efficient meter is installed in the face of the cabinet which changes its readings according to the position of the electrode on the patient's body. The multiplicity of controls helps to awe the person treated and to lead him to believe that he is obtaining real worth for his money.

Any engineer immediately guffaws when shown the thing. But, then, the engineer has technical knowledge and knows what he is about in the engineering field. None of the sharpers attempt to sell such stuff to men who know. It is the fellow who has no knowledge, but hopes—oh, how he hopes—to be cured and is willing, therefore, to spend his savings and put his watch in hock for the necessary money to try every new thing which puts in an appearance.

Now and then there is an altogether different plan pursued. And here is where the technical man is handed a gratuitous laugh which, at the same time, is harmless. One such instance came to light recently when



Hear the Murdock Neutrodyne

\$100 with built-in Loudspeaker

\$92.50 without

SEE the beauty of its cabinet. Hear its pure, sweet tone. Notice how easy it is to operate. Compare these things with any other hundred dollars' worth in radio. It is the Murdock Five Tube Neutrodyne. There is space in the cabinet for the "B" Batteries. The only accessories necessary are batteries and tubes. A "Murdock" set is backed by twenty years of successful experience in making radio apparatus.

WM. J. MURDOCK COMPANY Dept. A3, Washington Ave., Chelsea, Mass.

Branch Offices: New York, Washington, Chicago, Los Angeles, San Francisco, Seattle



MURDOCK RADIO PRODUCTS



Standard since 1904



Your Set Needs This New Glass Socket!

The voice of your radio will be noticeably improved when you use DURAY All-Glass Sockets.

These wonderful new sockets are made of Viralon, a processed glass which scientific tests have proven to be the most efficient "low-loss" insulation available to radio science. And through the Ezyklean Contacts, corrosion, the enemy of perfect contact, is automatically eliminated.

To insure perfect insulation and perfect contact for the life of your set, replace your present sockets with Durays. You'll soon realize the difference they make in the character and volume of current delivered to your loud speaker. Price \$1.25. Fully guaranteed.

Ask your Dealer-Write for Folder.

Live Distributors Wanted Everywhere.

DURAY RADIO CORPORATION Dept. 10, 261 Washington Ave., Newark, N. J.

OURAY
ALL-GLASS SOCKET

CARTER Vernier Control Rheostats



3-6-10-20-25-30 ohms Also Potentiometers, 200 or 400 ohms, \$2 Exclusive Carter made machinery for winding and patented method of clamping resistance which gives you vernier control, smooth contact and noiseless operation not found in any other rheostat.

Any dealer can supply these and Carter Potentiometers of same design.

Offices in Principal Cities.

In Canada—Carter Radio Co., Limited—Toronto

Carter Radio Co.

Insure your copy reaching you each month. Subscribe to Radio News-\$2.50 a year.

Experimenter Publishing Co., 53 Park Place, N. Y. C.

the writer received in his mail a circular from the M-Radio Research Laboratory.

There are theories in this prospectus, set forth in the most scientific terms, which are, to say the least, surprising.

to say the least, surprising.

It is claimed that hypnotism may be perpetrated by radio. But this is only the beginning. From this point, the gentleman proves, seemingly, that the "Powers of Evil" have set up great broadcast stations in all parts of the world, from which they send out hypnotic waves directed against the great leaders who are factors for law and order and civilization.

He goes into all sorts of technical explanations as to how the waves are generated and transmitted. He even publishes an "experiment"—which uses a special tube-carried on in a copper-lined room, in which these thought waves are detected and their effects noted.

Sandwiched in all this he gives his own theory as to the laws of gravitation and maintains stoutly that the earth and other planets are held to the sun by some sort of "waves."

Then he tells how one may make a success of life by cultivating certain powers for the detection of "thought waves," which seem to hold something in common with radio waves. The connection, to the engineering mind, is rather sketchy. He maintains that all life is made possible through waves and that every living thing gives them off. He has a method for detecting these waves, making it possible for every man to have the infinite omnipresence of God. Quite a little system, no?

Then, as usual, at the end of the pamphlet—profusely illustrated—there is the usual plea for help. It seems the director of the laboratory, whose views are set out in the text, needs money, lots of it, to continue his work as savior of civilization and law and order. And every now and then he gets the money.

The best laugh of it all is that he claims to have learned of a revolution which is to take place this year—engineered by the "Powers of Evil" of course—and which he needs money to combat. Since he is about the only man holding the secret to the method of fighting this terrible power, all contributions must be sent to him. They will be gratefully received.

The writer recently came across a religion based along the same lines. It, too, is seeking the financial aid of converts. The founder of this cult has found a book on radiation and waves in the Public Library and has, evidently, attempted to digest it. But the result seems to be the outcome of his dreams more than his scientific researches. There are some undiscovered octaves, as all scientists know, in the vibrations known to man, and this worthy has found them, he claims. And they, too, do great things like giving one power over his fellow-man,

These are just a few of the more obvious and well-known schemes to separate the wellknown public from their money through the cloak of science.

The stock method is, to the shame of the nation, more or less well known. Some company without a backing or established reputation goes into the field with a lot of promises and little tangible assets and gets all sorts of money. This is a field for an investigation in itself. It is principally financial and is in the province of the attorney rather than the engineer.

A good point for all to follow when confronted with such schemes is to get into immediate communication with some reputable authority and obtain the best possible advice. To the uninitiated it is extremely hard to tell the difference between the good and the bad. And sometimes there is a

CIRMIT



More Power per Tube brings Greater Radio Most Economically

SEE ERLA RECEIVERS

Inherent Erla advantages in power, tone and selectivity are now available in beauteous complete Erla receivers. Retail prices range from \$67.50 to \$225. Both price and performance place Erla receivers among the sensations of radio history.

Triple power is the basis of Erla Supereflex records. Tubes, as used in Supereflex, simultaneously amplify received radio frequency currents, reflexed radio and reflexed audio frequency currents. So 1-tube Supereflex rivals the power of conventional 3-tube circuits. And 3-tube Supereflex readily outclasses the ordinary five!

Only such power can give you the thrill of Supereflex distance and volume; always with Erla crystal-pure tone—and with uncanny selectivity that gets what you want when you want it.

This finer radio is brought within the reach of all by Erla Supereflex CIR-KIT, the factory-sealed carton of genuine Erla apparatus for building Supereflex yourself. Anyone can follow the CIR-KIT assembly plan perfectly, using only screwdriver and pliers, without drilling or soldering.

Pride of workmanship, extreme economy, priceless radio performance, are yours in Erla Supereflex CIR-KIT. Select your model at the Erla store. 1 to 5 tubes, antenna and loop types.

Electrical Research Laboratories Department C, 2500 Cottage Grove Avenue, Chicago





Young Men—Turn Your Spare Hours Into Money

Earn big profits, prizes, and awards selling RADIO NEWS, SCIENCE&INVENTION, The EXPERI-MENTER, and MOTOR CAMPER & TOURIST in your neighborhood. We train you as our salesmen and pay you liberally for your time. Write at once M. BRIDWELL and we will help you get started.

THE EXPERIMENTER PUBLISHING CO. New York, N. Y. 53 Park Place

chance for improvement through the use of some new scientific machine. It was only six months ago when a professor at Columsix months ago when a professor at Columbia University perfected a new type of Röentgen ray tube, which proved to be five times as effective in treating cancerous growths as those which were in use previously. It was soon put into operation in the chief hospitals of the country and proved exceedingly efficient. It is obvious in this exceedingly efficient. It is obvious in this case that the patient had everything to gain by submitting to such treatment, but if he had had an experience with the short wave oscillator which was good for creating radio

oscillator which was good for creating radio interference but worse than useless as a treatment for cancer, he would undoubtedly question its efficacy to his ill.

Here is the making of a good dilemma. The patient who knows nothing of the technique involved does not know which is good and which is charlatinism. Obviously, the solution, for those interested, is to keep up with the times by reading the pertinent periodicals or, if that is impossible, by writing to some authority who is conversant

with the facts.

The whole point is: Don't believe it unless you get unbiased and expert judgment on the claims made by those financially interested in it. There are any number of magazines and periodicals which will be more than willing to help you in this regard and for little or no expense. And the neces-sary trouble in asking them may be repaid a thousand times in the actual saving of time and money.

Thus far in radio practice and design we have had many kinds of "plexes" and "dynes," but we have never had, and may never have, an "anodyne."

KFI. Super-Power Station of the West

(Continued from page 2064)

three additional rooms have been built. care for the radio personnel a suite of offices have been constructed adjoining the new reception room and photographic studio. In all, seven new rooms have been added to the radio division.

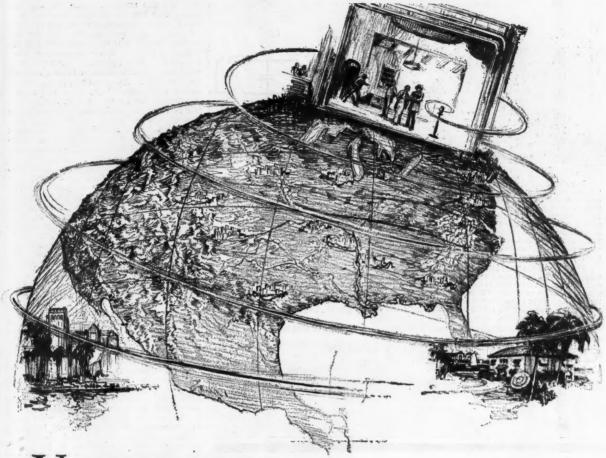
THE APPARATUS

The present transmission panel of the 500watt set occupies 30 square inches of floor space, is five feet in height, and is located in the control room. The dimensions of the new 5,000-watt transmission panel, which fills a separate room, are 16 feet long, seven feet high and nine feet deep. A wire cage is erected about it. The power, which is furnished by a commercial power circuit, is changed from A.C. to D.C. by large watercooled rectifier tubes, the voltage being increased by a special step-up transformer.

The water cooling is a unique feature, as

any great variation in temperature would interfere seriously with proper transmission. A certain flow is attained and held by means of an electrically driven circulating pump. A thermostatic control governs the flow of water around the tubes, and the temperature and cubic inches of water-flow are regis-tered on two dials set in the panel. The compensation of the cooling system to meet an increased temperature is automatic, and should the temperature increase beyond a given safety point, the current will be auto-matically shut off to save any possible dam-age to the set. The speech input equipment and the incoming telephone lines from distant KFI studios are located in the control room.

One motor generator and one spare take care of the needs of the present set, but three generators and three spares are installed in the new generator room. Between this room and the transmitter room is built into the



Unseen actors

that thrill an audience of millions

UT upon the still night come the sounds of a desperate struggle. Heavy blows splinter a door-there's a crash. A shot is fired—a woman screams!

And millions of radio listeners thrill as delightful gooseflesh creeps up their backs. For it is

not real bloodshed but WGY, the General Electric Company's broadcasting station at Schenectady, N. Y., giving a radio drama. On a single evening WGY has been heard and reported from every state in the Union. Hawaii, Canada, South America, and England.

In the broadcasting of this famous station, Exide Batteries are employed. All batteries in the equipment are Exides. A great many of the most important government and commercial radio plants use Exide Batteries.

They were selected for the navy airship Shenandoah and the great liner Leviathan. Exides went to the Arctic with MacMillan and helped the American airmen circle the globe.

Exide 6-volt "A" battery in one-piece case

There are also Exide "A



When you tune in

There is a complete line of Exide Radio Batteries made for home re-

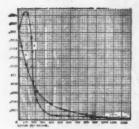
ceiving sets. They give uniform current through a long period of discharge and assure you the clearest reception. You will find them not only a great satisfaction, but a genuine economy.

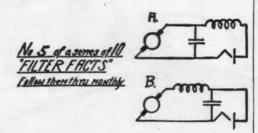
You can get Exide Radio Batteries at every Exide Service Station and at radio dealers. There is a type for every tube and a size for every set.

THE ELECTRIC STORAGE BATTERY COMPANY, PHILADELPHIA

In Canada, Exide Batteries of Canada, Limited 153 Dufferin Street, Toronto

FOR BETTER RADIO RECEPTION USE STORAGE BATTERIES





In a circuit containing constant values of inductance and capacity in series the distribution of the voltage across the various elements will be dependent upon the impressed frequency i. e. in B for a constant ripple voltage the voltage across the condenser will vary for various frequencies. The ripple voltage across the condenser is the ripple voltage across the tob. For high impedance loads across the condenser, such as a tube, this voltage rises to several times the value of the initial voltage. The peak of this rise is reached at a frequency slightly less than resonance. With increased frequency beyond resonance this voltage decreases rapidly soon becoming but a small fraction of the impressed voltage. The amplitude of the fluctuation of the current thru the plate circuit will vary with this voltage. Curve "B" shows the value of this current with the very excessive ripple voltage of 10 volts, a choke of approximately 10 henries and a one microfarad condenser, used with a "5 watter".

Fig. A shows the "cart before the horse" i.e., the voltage across the condenser will be full ripple voltage. The voltage across the plate will vary only as the impedance of the coli in series with it varies. This pur curves tend to show is a better filter at frequencies below resonance than "B" but not as good above resonance. "B" seems to be the most practical of the two. Roughly speaking it will magnify frequencies below resonance and greatly decrease those above. This means that its effectiveness depends upon designing it with as low a resonant frequency as possible, i. e., both inductance and capacity as large as possible.

These curves are plotted to an exaggerated scale. The maximum value is .0024 amperes and the minimum .0000025 amperes.

ELECTRIC SPECIALTY COMPANY TRADE "ESCO" MARK

211 South Street Stamford, Conn., U.S.A. ESCO POWER BEHIND YOUR TUBES MEANS MAXIMUM MILES PER WATT

For clearest reception



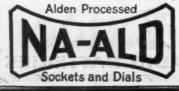
1. Low loss. Laboratory test in leading Engineering University proved that of 13 best known makes, Na-Ald Sockets were the only ones having losses lower than a good low loss conden-

2. Low capacity. The same test showed that Na-Ald has lowest capacity of any socket. This is very important for short wave length reception.

3. Positive side-scraping contact (not just side pressure) that cleans corrosion from tube terminals. Only Na-Ald Sockets have this essential feature. Use Na-Ald Sockets in the set you build or buy, if not already installed by the manufacturer. De Luxe, 75c; others, 35c and 50c.

Mail coupon for free booklet Send for free booklet of tested, selected circuits and interesting information regarding laboratory test.

ALDEN MANUFACTURING COMPANY, Dept. K6, Springfield, Mass. Also makers of the famous Na-Ald Dials



		field, Mass. booklet a		1	ahani
laborato	me tree ry test.	pookiet a	na particu	inte	2004
Name		***************************************			

wall a white marble switchboard, approxi-mately five feet by six feet, which controls the motor generators, electric lights, signs on the towers and transformers for the on the towers and transformers for the rectifier tubes. A plate glass partition in the wall is a feature of the transmission room so that the general public may see the set in operation. This partition is 10 feet long and six feet high. All metal structure, such as beams, lath and conduits, have been bonded together by brazing to prevent any absorption of radio frequencies back into the building. A new ventilation system is in process. ing. A new ventilation system is in process of installation that will insure a constant circulation of fresh air throughout the studio and reception room. The ceilings are false, and reception room. The ceilings are laise, or drop ceilings, and the space between the roof and the lower ceiling is converted into channels for the incoming air currents.

"Distance transmission is, after all, only a stunt," said Earle C. Anthony recently, "and, although important as a method of a stunt. extending the scope of broadcasting, it is not as important as perfecting the quality If the desired in the same of local transmission. And when I say local, I do not mean merely the surrounding hundred miles or so, but the Southwestern part of the United States. I look to the time in the near future when every State in the Union will be 'local' for KFI. We have installed the finest equipment procurable and will continue our policy of being in the forefront of radio broadcasters. The new KFI radio central super-station is as perfect as radio engineering can make it, but we mean to advance with any new departures, so as to insure our constantly growing audience the very finest reception.

very finest reception.

"The development of radio is not yet brought to a close, although the Western Electric Cempany's latest development, a 5,000-watt transmitting set, would seem to allow little room for improvement.

"The new set handles a much wider band of frequencies or, in untechnical language, higher and lower tones, and their finer graduation may be picked up by the public. The vast reservoir of power will allow not only a greater range of audibility, but will insure better quality during all times. Herefofore, during the day and especially during the summer months, atmospheric conditions, the summer months, atmospheric conditions, heat and static have caused such interference that broadcasting has not proved itself entirely satisfactory, except under the most favorable conditions. With KFI's new equipment, perfect reception at all times is foreseen. The public at large is assured of the best programs given under ideal conditions and, although no particular stress is being laid on distance transmission, the radio public in the Far East will hear KFI more easily than before."

The Most Novel Super-Heterodyne

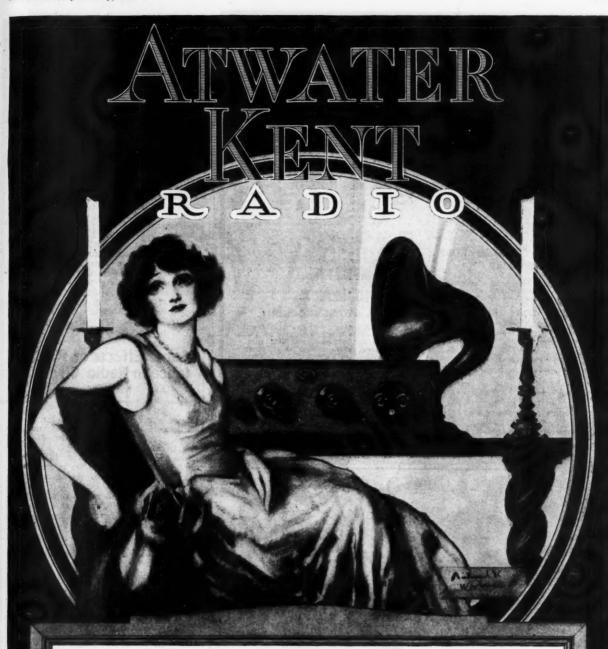
(Continued from page 2077)

side can only be accomplished by continued

side can only be accomplished by continued changes, and cut-and-try methods.

Zincite as a crystal is subject to widely fluctuating conditions. One piece will respond without any battery excitation at all. Another will be sluggish until it is jolted by a short circuiting across an "A" battery. Some will have to be baked in an across and the blackish impurities scraped off. oven and the blackish impurities scraped off, such as zinc sulphide. Zincite itself is ZnO, or zinc oxide, an orange-red colored mineral in a granular form, sometimes showing layand strata

Thus far there has been no time for obtaining reception results with this novel Super-Heterodyne receiver. All of the time available in the laboratory of the writer has been spent in getting together the necessary parts, testing them out, and making up a



70 own an Atwater Kent-

WHAT a wonderful, delightful difference it makes—just think what it means—in one evening the thrills of a lifetime are crowded into a few short hours.

Set its dials and the melodies of a famous orchestra flood your home; another touch and you hear a lecture from miles away—turn again and you have the news of the day or the sweet voice of a

renowned singer generously broadcasting for your entertainment.

Choose whatever program you will, with an ATWATER KENT you are master of the air.

There is an ATWATER KENT well within your means: it combines every feature that assures radio satisfaction for years to come—Any ATWATER KENT dealer will help you in your selection.

Interesting literature on request

ATWATER KENT MANUFACTURING COMPANY, 4713 Wissahickon Ave., Philadelphia, Pa.

THINK WHAT IS BACK OF IT

Marshall.inc. EQUIPMENT



THE SILVER SUPER

The 7-Tube Wonder Set. Coast to Coast with Loud Speaker Volume on a Loop.

S-M TWO-TENS AND TWO-ELEVENS

S-M DISTORTIONLESS AUDIO **AMPLIFIER**

Gives perfect tone quality on all vocal and orchestral music, with greater volume, at a cost no more than that of ordinary trans-former coupled amplifiers. Price each \$17.95

-M LOW LOSS CONDENSER

CIRCULARS

on 8-M products sent upon request.

GUARANTEE. Satisfaction or your money back is guaranteed with every S-M Product.

EASTERN DISTRIBUTOR Twentieth Century Radio Corp., 102 Flatbush Ave., Brooklyn, N. Y.

SILVER SUPERS **ENDORSED** by the "WHO'S WHO" of Radio

McMurdo Silver's 7-Tube Super-Heterodynes have received the universal endorsement of Radio Authorities. S-M Matched, Tested and Charted Transformers have revolutionized Super-Building. Silver Supers are famous mow for their consistent Coast to Coast reception with loud speaker volume on a small loop. You can build a Silver Super yourself with just three tools.

SILVER SUPER PARTS . Blue Prints for Laboratory Model ...

Mail Orders filled promptly—Shipments pre-paid East of Rockies.

The 4-TUBE KNOCKOUT

On a 70-foot antenna will do everything that the famous Silver Supers will do on a loop. It can be put together in a few hours on your kitchen table—non-radiating, operates almost as well on 190's as 201A's. Complete set of parts for the 4-TUBE KNOCKOUT

Send for McMurdo Silver's description of this, his latest circuit. Price......25e

Silver-Marshall, Inc. Dept. C. 105 So. Wabash Ave. CHICAGO



WADE SQUARE LAW CONDENSER UNIT

tents Pending

All sizes, complete with 4-lach vernier dial, for: Short wave ,000125 mfd. Tuned Radio Frequency, .00025 mfd. mfd. \$7.73 Super-Heterodynes, .0005 mfd. \$8.00 Oscillator, Wavemeters, etc., .001

At your dealers, otherwise send purchase arice and you will be supplied postpaid.

line wavelength curve - distributes stations evenly over dial and simplifies tuning of any station regardless of close similarity in wavelength with other stations.

Separately grounded frame eliminates all body capacity even in most sensitive sets. Facilitates precise tuning.

Designed to reduce all wear-capacity never changes due to wearing of bearings as in rotor plate type. Built in every detail for superior operating efficiency.

Write for descriptive folder

WADE MANUFACTURING COMPANY, Inc.

1819-A Broadway

New York



good, feasible diagram which will stand up under both theory and actual test. The theory of the Super-Heterodyne, as

The theory of the Super-Heterodyne, as we know it today, supports this effort to produce a new, radiationless Super-Heterodyne which will not only work, but also which will work under standard conditions!

There are now too many controls, too many separate batteries, and a lot of needless parts in the diagram of this new type of receiver. It will require a considerable amount of time and effort to weed out the "hugs" in this circuit, but we hope to be able. 'bugs" in this circuit, but we hope to be ableto show photographs and improved diagram and circuit constant data in a near future issue of Radio News. If we are successful in making this circuit work, we will publish the details of the distances covered, the types and values of the equipment used—and will show a simplified hook-up which will enable every home builder of a radio set to try his hand at this type of Super-Heterodyne receiver.

This may be the first step toward the elimination of the vacuum tube as a radio standard. The vacuum tube itself is not a perfect piece of equipment and it is subject to improvements and changes for the better, as the radio art progresses. The lowly crystal and the long-forgotten electrolytic detector may yet enjoy a renaissance which, when it comes, will greatly reduce the cost of radio to the average fan.

Some Effects of Resistance in Radio Circuits

(Continued from page 2081)

There is an interesting lesson to learn from this discussion, as it will illustrate that although, theoretically, certain benefits may arise from doing certain things, practically and economically it does not pay to do them. For instance, it will be shown in connection with Fig. 6 that whether the leakage path in a condenser is a quarter of an inch longer or shorter will not make any appreciable difference in its operation, despite the fact that many designers of condensers have wracked their brains trying to devise ingenious methods of mounting the plates in the condensers.

Fig. 6 shows a condenser which is supposed to have no series resistance, but has a leakage path for the current across its terminals. This is represented by r in the diagram. If this circuit be analyzed by the ordinary circuital laws of A.C. circuits, it will be found that the apparent resistance and capacity of the leaky condenser (across its terminals) are given by the formulae:

$$R^{i} = \frac{r}{1 + 0.0000 \ 39r^{3}f^{2}C^{2}}$$
 (4)

C' = C + -39.48 f2r2C

in which r is the resistance of the leakage path in ohms, f is the frequency in kilocycles, C, the capacity in microfarads, R, the apparent resistance in ohms, and C', the apparent capacity in microfarads.

If we assume a certain condenser having a capacity of 0.001 microfarad, and assume also that its insulation is so poor as to offer to the current a leakage path of only 1 meg-ohm (1,000,000 ohms), the apparent resist-ance of the condenser would be only 0.025 ohm at 1,000 kilocycles (300 meters) and its apparent capacity would differ from its true capacity by only 0.000025 micromicrofarad. It is ridiculous to suppose that even a poorly constructed condenser could have as low a leakage resistance as 1 megohm in fact, it may run into hundreds of megohms. Besides this, what difference would the

HE NEW GRE Of Course the Famous Crosley 51 Regular at Will be Continued

Here is the popular Crosley 51 dressed up in new clothes. It is known as the Crosley 51-Special. This two tube, genuine Armstrong regenerative receiver is exactly the same as the nationally known Crosley 51, except it is installed in a larger cabinet in which there is room for dry cell batteries. Also there is the slanting panel, a feature that adds to the appearance of the set and makes operation more comfort-

522 Sassafras St.

able. This radio is as artistic as it is efficient, appealing to the housewife who demands beautiful appearance and elimination of visible batteries. All Crosley radios are licensed under Armstrong Regenerative U. S. Pat. 1,113,149. Other models priced from one tube 50, at \$14.50 to the Trirdyn Special with sloping panel, at \$65. For sale by good dealers everywhere. Write for catalog.

Prices quoted without accessories. West of Rockies add 10%.

THE CROSLEY RADIO CORPORATION

Powel Crosley, Jr., President

Cincinnati, Ohio

Crosley owns and operates Broadcasting Station WLW



INTERFERENCE ELIMINATOR

WHAT RADIO USERS HAVE BEEN LOOKING FOR For those who have had Interference Troubles this new auxiliary tuning device will trap out the undesired stations

Select Your Stations At Will

The air is so crowded with music and voices that the average set fails to bring in the desired stations properly.

The Steinite Interference Eliminator shuts out local and other interference. You get one station at a time, whatever one you want, and can ence. You get one statio tune it in loud and clear.

Improved Results with Tube or Crystal

Try for yourself entirely at my risk the wonderful improvement this inexpensive little device will make in the reception of your set. Sold on absolute guarantee of satisfaction or money back and the greatest dollar's worth ever offered the radio public. Improves results on both crystal and tube sets that use an indoor aerial, outdoor aerial or light socket; but will not help a set using loop antenna. Clears up reception wonderfully and partially absorbs static.

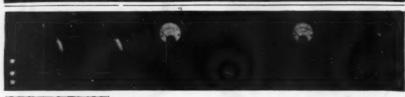
Mfrs. Famous 1,500 Mi. Steinite Tube Sets, \$12; Long Distance Crystal Set, \$6; De Luxe Crystal Set, complete with headphones, aerial and ground, \$10; 2 Tube Set, \$16; 2 Tube Amplifier, \$15. FREE descriptive literature on request.



Amazing Satisfaction or Money Back

Put this interference eliminator on your set and note amazing improvement. No tools needed—installed in a moment's time. Full directions with each instrument. Simply connect with set and follow instructions. Requires no additional tubes or batteries. You must be pleased and delighted or you get money back promptly. \$1.00 postpaid anywhere in U. S. when cash with order. These two big Atchison banks will testify to my reliability: Exchange National Bank, Atchison Savings Bank. Order today—a dollar bill will do.

STEINITE LABORATORIES, 1060 Radio Bidg., ATCHISON, KANSAS



Super-Power 6-Tube Pliodyne 6

THOUGHE 6
The famous new Golden Leetz
Model, Bange 1,500 to 5,000
miles. Two sages nich of
the famous new miles frequency; detector and three
stages and/of requency amplification. Solid mahogany
cabinet. Finest materials
throughout. Garanteed
mechanically and electrically
perfect. Completely constructed, without accessories, \$60

For any Circuit

Prompt shipment can be made on tested, standard apparatus of the following manufacture:

E. I. S., Inc.
General Radio
Ultradyne
Sangamo Electric
Benjamin Electric
Allen Cardwell
Dubilier Formica
Weston Magnavox
Jewell Amer Tram
Western Electric
Magic Master
Cutler Hammer
Frost
Federal

Super-Heterodyne C-7

Model C-7, the Long Distance Concert Receiver With a Telephone Range of 3,000 Miles

FEW of the so-called new "circuits" or modifications of standards approach the C-7 in efficiency—for long range, for high audibility, for selectivity. Experimenters' Information Service design. Seven tubes give the result of ten because this model allows signals to be regenerated and heterodyned through radio frequency amplifier.

> E. I. S. Model . . . All material we furnish is endorsed and recommended by the designers.

Using the finest apparatus and building to Naval standards, Model C-7 has a telephone range of 3,000 miles.

Norden-Hauck Price List Saves You Money

Free Information—Write for descriptive matter and price list. Our service is as near as your mail box.

Full Stock on Hand-We carry complete stocks of laboratory tested apparatus for immediate shipment.

NORDEN, HAUCK, INC. Engineers, Office and Laboratories

The World's Most Popular Battery Charger
Write for Booklet
THE AUTOMATIC ELECTRICAL DEVICES CO.
121 West Third Street Cincinsati, Ohie



ADJUSTABLE CIRCLE CUTTER A great help to the Badio Builder. It drills own pilot and cuts out plug in one operato 4 inch holes. Price. \$1.75 Same tool but does not drill own pilot. Price. \$1.75 Same tool but does not drill own pilot. Price. \$1.56 Remit by Cash or Money Order Jobbers & Distributers write for Discounts. Peepel Reveily Works.

Insure your copy reaching you each month. Subscribe to Radio News-\$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

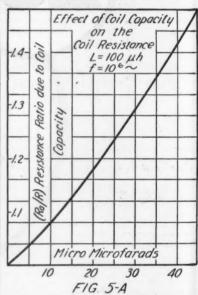
0.000025 mmf. make to anybody? The point is that the leakage path has not much to do with the efficiency of the condenser, provided its resistance is not too low.

SHUNT RESISTANCE OF CONDENSEDS

In the above discussion we have neglected the series resistance in the condenser. The plates of the condenser have resistance, and there may also be resistance at points of contact, soldered joints, etc., inside the con-denser. Fig. 7 represents the equivalent state of affairs in which the internal resistance of the condenser is represented by R and the leakage path by r. The formulae for this case are rather complicated, but they can be simplified if we assume that the series resistance is small compared with the leakage resistance. The relation then becomes

$$R^{1} = R + \frac{1}{0.0000 \text{ f}^{2}\text{C}^{2}\text{r}}$$
 (6)

It we now assume the same 0.001 microfarad condenser, operating at 1,000 kilocycles, increases the apparent resistance of the condenser by only 0.01 (one hundredth) of an ohm, the leak resistance, r, would have to be as low as 2.5 megohms. The apparent capacity is not affected appreciably.



Curve showing how small the effect of coil capacity on the resistance of single layer coils is, even for abnormally high capacities.

To further emphasize this fact, formula No. 6 has been plotted, as shown in Fig. 8. The apparent resistance of the condenser remains practically unchanged for leak resistances greater than about 3 megohms, but even for leak resistances as low as 1 megohm, the apparent resistance does not change more than about 0.02 of an ohm. This is very small compared with the series resistances of condensers which are in the neighborhood of 1 ohm, so that it seems that more would be gained by directing the attention of designers toward reducing the series resistance than by concentrating their efforts toward reducing the leakage currents.

LOSSES IN COILS

We will next consider a coil which has both resistance in its wire and resistance which is equivalent to faulty or leaky insulation. This is a case in which R, the resistance of the wire, is in series with the inductance, L, of the coil, and the pair shunted by the leakage path, r.

The condition represented by this circuit is a very common one in ordinary radio practice and is one of the causes of the relatively high resistance of the coils used in so



They Cost More

But They Do More



Zenith-

the exclusive choice of MacMillan for his North Polar Expedition

Zenith Supremacy will be Maintained

This message brings to radio enthusiasts the announcement of an advance in Zenith prices on all models. The new prices are shown in the panel at the right.

Radio sets—like motor cars and pianos—gravitate to their correct price level. There is more to a radio receiving set than merely a beautiful cabinet backed by extravagant claims. It must meet exacting requirements. The novelty has worn off. The public is becoming educated. It knows what to expect and can now distinguish merit in radio.

An imposing name and an intensive advertising campaign—when they back a radio product which does not deliver equally impressive results—soon lose their fictitious values.

By that same token, performance which is literally outstanding fixes

for the makers of that product a standard of supremacy which, in duty to the public, they are obligated to maintain.

Throughout the radio world the name ZENITH has come to be the very symbol of results—in quality of tone, in simplicity, in selectivity, in volume without distortion, and in long-distance reception. The artistry of design for which it stands is too well known for comment.

The fact that ZENITH has advanced its prices is of more than passing moment. For it registers the determination on the part of the builders of ZENITH to maintain the acknowledged supremacy of ZENITH receiving sets—both in beauty and performance.

All present models are guaranteed against price reduction.

Dealers and Jobbers: Write or wire for our exclusive territorial franchise.

Zenith Radio Corporation
332 S. Michigan Ave. Chicago, Ill.

The complete Zenith line ranges in price from \$100 to \$475.

With either Zenith 3R or Zenith 4R, satisfactory reception over distances of 2,000 to 3,000 miles is readily accomplished, using any ordinary loud speaker. Models 3R and 4R licensed under Armstrong U. S. Pat. No. 1,113,149. They are NON-RADIATING.

Zenith 4R - - \$100 Zenith 3R - - \$175

The new Super-Zenith is a six-tube set with a new, unique, and really different patented circuit, controlled exclusively by the Zenith Radio Corporation. It is NOT regenerative.

SUPER-ZENITH VII—Six tubes—2 stages tuned frequency amplification—detector and 3 stages audio frequency amplification. Installed in a beautifully finished cabinet of solid mahogany—4½ inches long, 16½ inches wide, 10½ inches high. Compartments at either end for dry batteries. Price (exclusive of tubes and batteries) \$240

SUPER-ZENITH VIII—Same as VII except—console type. Price (exclusive of tubes and batteries) \$260

SUPER-ZENITH IX — Console model with additional compartments containing built-in Zenith loud speaker and generous storage battery space. Price (exclusive of tubes and batteries) \$355

All Prices F. O. B. Factory.

,	
	ZENITH RADIO CORPORATION Dept. 5-B
ı	332 S. Michigan Ave., Chicago, Ill.
	Gentlemen: Please send me illustrated literature about Zenith radio.
	Name
	Address.



Hear it—in comparison this masterpiece of the oldest loud speaker makers!

The more "good" loud speakers you have heard, the greater will be your delight upon listening to The Amplion. Unapproached sensitivity, a rich, full, natural tone and marvelous volume have won for The Amplion the largest world-wide sale. These qualities result from thirty years' experience on the part of the originators and world's oldest makers of loud speakers. Visit your dealer for a comparison. Literature on request.

*Alfred Graham & Co., London, England, Patentees The

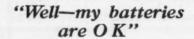
AMPLION CORPORATION OF AMERICA







No. 22-About 1/3 actual size



And that's only one satisfaction that the owner of a Nagel Voltmeter enjoys. Another, and a very important one, too, is the assurance that you have a high resistance instruone that will not drain your batteries. (60 ohms per volt is the Nagel standard!) Still another satisfaction is the sensible price you paid for a strictly quality product. See your dealer or write The W. G. Nagel Elec-tric Company, Hamilton Street, Toledo, Ohio.



Makers of the well-known Nagel Automobile measuring instruments of which over 6,000,000 are giving daily



HIGH-RESISTANCE VOLTMETERS

VOLTAMMETERS · BAKELITE HOT MOULDED INSULATIONS

LEARN THE CODE AT HOME



THE OMNIGRAPH MFG. CO., 20 HUDSON STREET, NEW YORK CITY
If you own a Radio Phone set and don't know the code—you are missing most of the fun

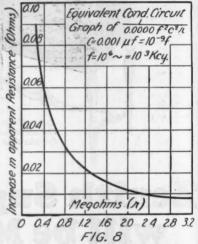
Insure your copy reaching you each month. Subscribe to Radio News-\$2.50 a year Experimenter Publishing Co., 53 Park Place, N. Y. C.

many hook-ups. The leakage resistance, however, must not be confused with the losses due to the capacity of the coil. Coil capacity is another of these causes which should be reduced as much as possible. But the point that must not be forgotten, and which has been elaborated upon in the writer's article in the January issue of Radio News is that both the losses due to leakage paths and coil capacity are small as com-pared with the actual losses in the wire, due pared with the actual losses in the wire, due to its ordinary resistance, which has been considerably increased by the skin effect. Good engineering practice reduces the more serious causes or losses first, and considers the other refinements afterwards. The mere fact that a coil is wound "on air" or has its turns zig-zagged does not mean that it is a low loss coil. These resistants of severe is a low-loss coil. There are points of more importance to consider, which have been described in the above-mentioned article.

The analysis of the circuit of Fig. 9 re-

sults in the following expressions for the apparent resistance and the apparent in-

ductance:



Showing the change in equivalent resistance of a condenser due to shunt resistance.

$$R^{1} = R + \frac{0.000039 \text{ f}^{2}L^{2}}{r}$$

$$L^{1} = \frac{L}{1 + \frac{0.000039 \text{ f}^{2}L^{2}}{r}}$$
(8)

in which the symbols have the same meanings as before. It will be remembered that in the case of a leaky condenser considerable reduction of the resistance of the leakage path did not increase the apparent resistance of the condenser appreciably. In fact, for a leakage path as low as 1 megohm, the apparent resistance did not change more than about 0.02 ohm. The leakage path more than about 0.02 ohm. The leakage path has a greater effect in the case of coils, however, as will be seen from Fig. 10, which has been plotted from Equation 7. A leakage path of 1 megohm in this case causes an increase in the coil resistance of about 0.4 ohm, or nearly half an ohm. This leakage path might easily be furnished by moisture in the insulation of the wire on the coil or dust or dust.

CONCLUSION

The effect of the leakage path on the inductance of the coil is to lower it. In this particular case of a 1 megohm leakage path, the apparent inductance of the coil will be reduced about 30 per cent. This will make no difference in operation, excepting that more of the tuning condenser will have to be used to tune to a given wave-length.

25

he oil ch

ut nd he

ge nue en

re re as it re

e-1e

t

n

How to Build The Ultradyne (Model L-2)

by R. E. Lacault, E.E., A.M.I.R.E.

How You Can Build This Remarkable Super-Heterodyne In Your Own Home



A Home Built Ultradyne

R. E. LACAULT

Designer of the Ultradyne Receivers and formerly Associate Editor of Radio News, is now Chief Engineer of the Phenix Radio Corporation.

THE Ultradyne Model L-2 is an improved Super - Heterodyne designed to so simplify its assembly that anyone can successfully build it at nominal cost and enjoy even greater performance than with any other type of Super-Heterodynes.

Every step is explained in an illustrated thirty-two page book, "How to Build and Operate the Model L-2. Ultradyne," in a non-technical way that one knowing nothing of radio finds easy to follow. Thousands have built the Ultradyne Model L-2 from instructions in this book, and thousands like Arthur Bender of 116 East Second Street, Covington, Ky., say it's the most wonderful receiver they have ever known.



The "Modulation System" of radio reception and the successful application of regeneration are vital features incorporated exclusively in the Model L-2 Ultradyne that give it greater sensitivity, greater range on the loud speaker and greater selectivity, than any other Super-Heterodyne. The Ultradyne Model L-2 detects the faintest broadcast signals—signals that other receivers fail to get, regenerates and makes them audible on the loud speaker. The Ultradyne easily tunes out

powerful local broadcasting completely and brings in distant stations clearly on the loud speaker. No other Super-Heterodyne can give you such performance.



The Ultradyne Kit furnishes all special parts, required to build the Ultradyne, with these superior Super-Heterodyne features. The kit contains 1 low loss Tuning Coil, 1 low loss Oscillator Coil, 1 special Type A Ultraformer, 3 Type B Ultraformers, 4 matched fixed Condensers. The complete kit can be bought for \$30 from

bought for \$30 from any reliable dealer. The Ultraformers are new, improved long wave radio frequency transformers, specially designed for the Ultradyne Model L-2 and are vital to the unusual efficiency of the receiver. To protect the public against imitation, every Ultraformer carries the

Lacault monogram seal (R. E. L.) and is guaranted so long as this seal remains unbroken.

The Ultradyne Model L-2 has met with phenomenal success—success built purely on performance alone—its system of radio reception has been the envy of the largest radio manufacturers in the country. Now anyone who uses the Ultradyne Kit and follows instructions can build the Ultradyne Model L-2, the improved Super-Heterodyne, with positive assurance of getting better results than with any other super radio receiver.

ULTRADYDE MODEL L-2

This trademark (Ultradyne) is a guarantee of perfection and satisfaction in a radio receiver, and applies to all receivers designed and built under the personal supervision of R. E. Lacault.

21	This Coupon is Worth 25	25)
	PHENIX RADIO CORPORATION, RN 114 East 25th St., New York City. Gentlemen: Enclosed find 23c in stamps, together with coupon valued at 23c, for which please send me your regularly 50 cent priced Book of Instructions on "How to Build and Operate Ultradyne Model L-2." Name	
2	Address	25)



A \$150 Receiver selling for \$68.

As fine a five tube Receiver as was ever made.
Circuit is the Biltmore improved Radio frequency type, built of low-loss instruments, highest grade materials, mahogany hand-rubbed cabinet, mahogany finish panel, metal parts nickel plated.

Extremely sensitive, matchless selectivity, and of pure perfect tone.
"Well worth twice the price," say

Model T5 For Sale By All the Better Radio Dealers Write for descriptive literature. Dept. M.

THE BILTMORE RADIO COMPANY, BOSTON 30, MASS.



On Rheostats Too The Contact's the Thing Here's how It's Done On

GOOD CONTACT is only one big reason why the highest grade set makers choose Klosner's in preference to other rheo-

resistance wire, (Cor-always means bad con-Connector piece too, is springy phosphor-bronze best shape for good

of heat snape contact.

4. End terminal upon which contact arm slides and stays ex—not nerely touching and making foose centact. SEND FOR THIS

This valuable Rheostat Chart and information on care of vacuum tubes sent free on request. The most complete and reliole guide to the propole of rheostats.

Write for it today!

other important features of Klosner Rheostat design make it stand out among "just rheostats." Those who know always insist upon "genuine Klosner's." See them at your dealer before buying rheostats. It will amply pay you to refuse substitutes or imitations, and if necessary, to send direct to us for your rheostats. Delivery postpaid.

Two styles-

With Knob and Pointer\$.90 For 2 ohms or 60 ohms with knob.....1.15

Klosner Radio Corporation

1022 East 178 Street, Dept. RN, N. Y. C.



Price \$1.00

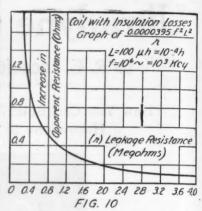
JUST THE BOOK YOU WANTED "Radio News"

Amateur's Handibook Volume No. 1 (Fourth Printing)

Chock full of radio constructive and instructive articles from cover to cover. Written by foremost radio authorities, in plain everyday language which everyone can understand. Sections include articles on Receiving Sets and Sundry Apparatus, Transmitters and Accessories, Radio Theory, Vacuum Tabe Data, and Practical Hints for the Amateur. A book which also serves as a ready reference and should find a place in the library of every amateur. It contains 224 pages and over 375 illustrations, diagrams, and photographs, bound in a multi-colored heavy board. On sale at all leading radio stores. If your dealer cannot supply you, send a dollar bill and the book will be forwarded to you postpaid.

EXPERIMENTER PUBLISHING CO., Inc. 53 Park Place, New York

It would be possible to thus go on forever, analyzing every form of circuit known. It is needless to do this, because all circuits are combinations of these elementary ones which have been described. Thus, the secondary or closed circuit coupled to the an-



Showing the change of resistance of a coil due to shunt leakage paths.

tenna or open circuit, and connected to the input of an electron tube, may be considered as a condenser shunted by a leakage path (the grid leak resistance) and the combination connected in series with the inductance and resistance of the tuning coil.

A knowledge of these facts is necessary to the designer of radio apparatus and circuits, for as much depends on the proper proportioning of the various pieces of apparatus, as upon the proper use of these.

I Want to Know

(Continued from page 2110)

A. 1. You should trave no difficulty in constructing a very satisfactory instrument from the circuit shown and the following data.

The latest model of this unit has a push button connected to the grid binding post of the socket and to the "A" battery in such a way that the grid connects directly to negative "A" when the button is normally out. When depressed, the grid is connected directly to the rheostat (which is connected in the positive lead of the "A" battery). The rheostat is a special one having three sections of three different resistances. When the switch arm is turned one-third of the way, the resistance is 5.5 ohms; when all of the resistance is incircuit, the total resistance is 60 ohms with a carrying capacity of .25 ampere.

The resistance "R" may be wound on a wood spool about ¼ inch long and ½ inch in diameter. For the unit mentioned this spool is wound to a resistance of about 1,000 ohms with a wire having a zero temperature coefficient of resistance, such as manganin, constantan or advance. The model without the grid bias polarity button has a coil wound to only 300 ohms. The value of this resistance lies in its largely preventing burning out of the plate milliameter accidentally.

Use a single storage cell or a single dry cell for tubes having a terminal voltage of 1.1 volts, such as the C-11 and WD-11 tubes.

Use a single storage battery or fore dry cells in series, for tubes having a terminal voltage of three volts are resistance as the 399 and UV-199 tubes. Use a regular three-cell storage battery or four dry cells in series when testing tubes having a terminal voltage of three volts age of five volts such as the C-301A and UV-201A tubes.

The value of a vacuum tube 2s an amplifier may be said to be, roughly, proportional to the

tubes.

The value of a vacuum tube as an amplifier may be said to be, roughly, proportional to the plate current change for a given grid voltage

plate current change for a given grid voltage change.

The application of this in the instrument under consideration is given below.

With normal tubes, a definite current will flow in the plate circuit of the tube when the filament is operated at the rated terminal voltage. This direct current will be indicated by the plate milliammeter. Now, reversing the grid polarity should result in a considerable change in the milliammeter reading. The amount of this change will indicate the value of the tube; a relatively large change occurring, if the tube is a very good

25

na-

ood ter.

det

ent his illi ulc illi



Balkite Radio Power Units

give your set greater clarity, distance and volume

Your radio set will perform consistently only if your power supply is unfailing. Balkite Radio Power Units provide a convenient power supply that furnishes a constant, uniform voltage to both "A" and "B" circuits. The Balkite Charger keeps your "A" storage battery charged and operating at full efficiency. Balkite "B" replaces both "B" storage batteries and dry cells, and supplies plate current from the light socket. The Balkite Battery Charger

and Balkite "B" are based on the same principle. Both are entirely noiseless in operation, have no moving parts or bulbs, have nothing to adjust, break or get out of order. They do not create disturbances in either your set or your neighbor's, require practically no attention, and can be put in operation at any time by merely connecting to the light socket. Their current consumption is very low. Both are guaranteed to give satisfaction.

Sold by leading radio dealers everywhere

Balkite Power Units

BALKITE BATTERY CHARGER - BALKITE "B" PLATE CURRENT SUPPLY

Finds Resistance of **B-T Condensers Less** Than Laboratory Standard

B-T Type L Condensers taken from stock have a lower resistance than a precision laboratory standard, according to the following letter from Prof. J. M. Wilcox, of Armour Institute of Technology. Not claims, but facts from an unbiased authority establish the worth of these Condensers. Can your next set?

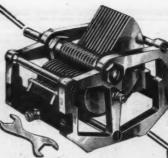
BREMER-TULLY MFG. CO., Chicago, Ill.

Chicago, III.

Gentlemen:—When the Bremer-Tully condensers were in the circuit the current was from 1 to 2% greater than that obtained with the Standard. It was necessary to introduce about 1. dom in the circuit to bring the current to the same value as that obtained with the Standard.—The equivalent resistance of the Bremer-Tully condenser is therefore less than that of the Standard by approximately .1 ohm.

Yours very truly,

(Signed) G. M. Wilcox, Prof. of Physics.



L- 7-150 M.M.F. (.00015	
M.F.), 7 plate	4.25
L-11-250 M.M.F. (.00025	
M.F.), 13 plate	4.50
L-23-520 M.M.F. (.00052	
M.F.), 23 plate	5.00
L-35-750 M.M.F. (.00075	
M.F.), 35 plate	6.50
Clockwise Reading	

"Better Tuning"

The 7th edition of "Better Tuning" is now ready, 48 pages of hook-ups and helps to set builders. Ask dealer or mail on receipt of 10

Bremer-Tully Mfg. Co. 532 S. Canal Street, Chicago

Pioneers of "Better Tuning"

BATTERIES

BATTERIES WITH A REPUTATION

STORAD Batteries have a reputation for giving reliable service under severe requirements of modern receiving sets.

When you buy Storads you may be sure that you have solved your "B" circuit power problem once and for all.

Made in Two Sizes No. 4524—4½ amp. hr.—24 volts No. 4548—4½ amp. hr.—48 volts

Desirable territory for Distribu-tors for the Storad line Storage Batteries is still available. Literature sent on request or ask your Dealer.

THE CLEVELAND ENGINEERING LABORATORIES CO.

2112 Superior Viaduct, N. W., Cleveland, Ohio



"REFLEX SPECIAL"
QUICK CONTACT
RECTIFIER
Withstands Heavy Plate Voltage
he Asses Apparatus Co. 2234 "grevent disricion and heaving by using a BROWNELE CRYSTAL
in REFLEX SETS."

From Your Daster or Direct

From Your Daster or Direct

ROLAND BROWNLIE & CO.



Learn to Draw Cartoons at Home

A wonderfully simple method makes it amazingly easy to become a professional cartoonist right at home in a few minutes' daily spare time. Enjoy easy hours—freedom from routine—and make \$100 a week or more. Write for Free Book which tells all about this easy method. Mail card TODAY.

Washington School of Cartooning Room 1045-C. 1113-15th Street, N.W., Washington, D. C.

Young Men---Turn Your Spare Time Into Money

Earn big profits, prizes, and awards selling RADIO NEWS. SCIENCE & INVENTION, THE EXPERIMENTER, and MOTOR CAMPER & TOURIST in your neighborhood. We train you as our salesman and pay you liberally for your time. Write at once and we will help you to get started.

M. BRIDWELL

THE EXPERIMENTER PUBLISHING COMPANY 53 Park Place New York, N. Y. amplifier. The most important point to observe is the rise in plate current value when the tube grid polarity is made positive by depressing the push button. This ratio, which should be high, is of more importance than the exact values indicated.

Q. 3. What is the resistance range of the Turn-It variable grid leak?

A. 3. Rated approximately from ½ to 5 megohms.

DUCON ANTENNA PLUG

DUCON ANTENNA PLUG

(2114) Mr. Thomas D. Burnett, Riderwood,
Md., asks:

Q. 1. What are the capacities of the two fixed
condensers used in the Ducon antenna plug, using
the lighting circuit as aerial?

A. 1. One condenser is about .0003 mfd. capacity
and the other is approximately .003 mfd. capacity.
Q. 2. A push-pull amplifier of the type described on Hook-Up Sheet No. 14 (circuit No.
66) appearing in the December, 1924, issue of
Radio News seems to be connected up exactly as
shown in the diagram, but signals are made
weaker rather than stronger. What could cause
this?

A. 2. This is probably explained by the fact that the "B" battery should have been reversed so that "B" minus connects to the "A" battery instead of "B" plus, as shown.

Q. 3. I have been asked what "R3" means, referring to code signal audibility. Can you advise me of the interpretation?

A. 3. The audibility table from which this is taken is not generally used by United States amateurs, which is to be regretted. The audibility table in regular use overseas is as follows:

CODE SIGNAL AUDIBILITY AT RECEIV-ING STATION

R1—Almost inaudible.
R2—Perceptible.
R3—Extremely feeble.
R4—Very feeble.
R5—Very weak.
R6—Weak.
R7—Fair.
R8—Loud.
R9—Loud speaker volume.

PHONE AUDIBILITY AND QUALITY

M1—Speech garbled. M2—"Hashed" speec

M1—Speech garbled.
M2—"Hashed" speech.
M3—Uneven modulation.
M4—Clear voice.
M5—Very clear, modulation perfect.

SECOND HARMONIC SUPER-HETERODYNE

(2115) Mr. O. Leslie, Argonia, Kansas, asks:
Q. 1. Will you please show the diagram of connections employed in the R. C. A. second harmonic Super-Heterodyne, together with construction data and an explanation of the principle of protection?

struction data and an explanation of the principle of operation?
A. 1. In Fig. Q-2115-A we are illustrating in a general way the principle involved in the second harmonic Super-Heterodyne. This picture is to be compared with Fig. Q.2115-B.

In the circle A of the picture diagram is a representation of the weak incoming broadcast signal. Circle A-1 represents this same signal made stronger by the amplified action of the first vacuum tube. This tube does nothing but amplify signals. It is reflexed in a manner to be described later.

made stronger by the amplified action of the first vacuum tube. This tube does nothing but amplify signals. It is reflexed in a manner to be described later.

The amplified plate current of the first tube is transferred by induction to the grid circuit of the second, tube. This grid current is shown in circle A-2.

This second tube acts as the first detector and also as the frequency changer.

If you will count the number of cycles represented in A, A-1 and A-2, you will see that there are nine complete cycles.

You will note that in B-1 we have only four cycles. This is the strong fundamental oscillator frequency This is the strong fundamental oscillator frequency. This is the next operation to be considered. When one frequency is added to a different frequency the combination of the two produces beats which may be considered as another frequency. This "beat" frequency is the difference in frequency between the first two. For instance, if an audible note of 1,000 cycles is sounded at the same time that an audible note of 400 cycles is sounded, a listener will hear these two and still a third note having a frequency which is the difference between the two, or 600 cycles. This, the production of a third frequency by adding one frequency to another, is "heterodyning." In our example of audio sounds, the third frequency of 600 cycles is called the "beat," or "beat frequency."

Our fundamental oscillator frequency, producing a beat note or intermediate frequency, of 5 cycles, heterodynes the A-2 frequency, producing a beat note or intermediate frequency of 5 cycles. However, let us suppose our intermediate frequency of 5 cycles does not affect the filter coupler in the second tube plate circuit, tuned to the frequency C-1 of 1 cycle.

QUALIT



Offer You a Radio Service Unequalled

BREAKHARA SAN 250,000 customers from every part of the world have purchased their Radio needs from us SEND FOR THIS FREE CATALOG

Contains all the newest parts, sets and kits at prices that save you money



VACUUM TUBES Standard Brands—Cunningham, Radiotron. Every one guaranteed new and perfect and in original carton. We will ship brand in stock unless you specify other-wise.



Ti01 WD12, C12, Each. 2.69
Ti02 UV199, C299, Each. 2.69

ADAPTERS
To use dry cell tubes in standard base sockets simply insert one of these adapters in the socket. 40e
Ti09 For WD11 or C11 tubes 40e
Ti09 Each C11 ... 35e
Moulded of genutine red
Forom bakelite. Binding
post conections. Strong
contacts. Real values.

METAL TUBE SOCKET
Ti34 Each 25e
Nickel plated brass tube set
in best grade composition
base, Plainly marked binding
posts. An excellent value.

STANDARD TUBE SOCKET
Ti50 Single Gang. ... 2.6
Ti53 Three Gang. ... 2.7
Each C11 ... 2.7
Each C12 ... 2.7
Each C13 ... 2.7
Each C13 ... 2.7
Each C13 ... 2.7
Each C13 ... 2.7
Each C14 ... 2.7
Each C15 ... 2.7
Each C17 .

your set.
T156 400 ohm Potentiometer. Matches above rheostats. Each89c



FILAMENT CONTROL RHEOSTATS
T122 6 ohm. Each...36e
T129 20 ohm. Each...36e
T131 30 ohm. Each...36e
T131 30 ohm. Each...36e
T135 6 ohm Verniert...78e
Best grade. Will give real
service. Durable and lasting.
High heat resisting base,
ished black knob, 1½" diam.
Petentiemeters. Match. above riscostats.
T151 200 ohm. Ea.52e T152 400 ohm. Ea.58e

RADIO "BAKELITE" PARELS
We supply genuine Bakelite, Condensite,
Celeron or Formica, all of which have practically identical properties. Machines well
without chipping, Won't warp. Waterpoof,
One side has attractive natural polished
plack finish which can be sanded and olicid
may be used as front. Postage 16c each
extra.

Panel	%" thick	3/16"thick	1 34"	thick
Size	Art.	Art.	Art.	
Inches	No. Price	No. Price	No.	Price
6x 7	T450 \$.55	T460 \$.89	T470	\$1.15
6x1034	T451 .86	T461 1.10	T471	1.60
7x10		T455 1.28		
7x12		T456 1.64		
7x14	T458 1.38	T468 1.73	T478	2.35
7x18	T453 1.78	T463 2.27	T473	3.15
7x21	T457 2.05	T467 2.65	T477	4.10
7x24	T459 2.42	T469 2.97		
7x26	100 100 100	T462 3.25		
9x14		T464 2.35	T474	3.15
12x14 12x21		T465 2.97	T475	3.98
12821		'T466 4.25	T476	5.70



1		100.			
8	lack		Shaft	Mahe	gany
No.	Price	Diam.	Size	No.	Price
T921	16e	2"	3/16	T926	19e
T922	16e	2"	1/4	T927	19e
T923	228	3"	3/16	T928	26e
TOOL	200	APP	1 1/4	T026	2.06



....\$8.4521.9521.90 r...21.00 r...31.75 r...26.50 t...4.35 unit 4.8510.88 STANDARD BRAND HEADSETS

| Section | Sect

T502 .0001..29e T503 .00025.29e T504 .0005..29e T505 .001..33e T506 .002..33e T507 .0025.33e T508 .003 . 40e T509 .001 . 40e T510 .005 . 48e T511 .006 . 60e

.......38e eme

T265 Ribbed Porcelain insulator—5 inches long. Ea...15e

STRANDED ANTENNA WIRE Cabled of fine copper strands. Very flexible. High tensile strength. Heat for aerials. T248 100 ft. coil 56e T249 500 ft. coil \$2.60

SUPERIOR RADIO SWITCH

T263 Each29e
A switch fully equal to any
on the market at a price
about half what is usually asked for a switch of anywhere
near equal quality.

SUPERIOR RADIO JACKS
Finest grads leeks.
Improved design.
Best materials.
Phosphor bronze
springs. Silver connanels % to % in.
Sach ... 33e
1392 Two circuit. Each ... 35e
1392 Two circuit. Each ... 45e
1393 Single circuit. filament control. 48e
1394 Two circuit filament control. 48e
1394 Two circuit filament control. 48e



value ever offered

A five-tube radio frequency set that brings in the distant stations on the loud speaker. All the volume you could want with the finest tone quality, clear and sweet. Careful designing with big quantity production make our low price possible. Only the finest quality materials used throughout. New style efficient low loss condensers and transformers. Bakelite panel size 7x18 in. Handsome mahogany finish cabinet. Neat convenient dials. We can recommend this set for either city or country use. Will not reradiate and will bring in stations from coast to coast. No set approaches this for value. Equals many sets selling at double and triple our price. Try it for ten days. If you are not satisfied return it and we will relund your money. 1867 Set. only 1867 Set. only 1867 Set. only 1868 Set complete with five 2014 tubes, 90 wits 8 battery, 100 ampere storage battery, one 7613 Speaks Speaker, and essmelet antenna equipment. Nething extra to buy. Price

102 So. Canal St. Chicago, Ill

No.	Max.	Plain	Туре	Vernie	г Туре
Plates	Cap.	No.	Price	No.	Price
3 5 11 17 23 43	.00025 .00035 .0005	T815 T816 T814 T817 T813 T812	\$.79 .89 1.00 1.20 1.30	T825 T824 T826	\$1.85 2.25 2.46



-	CONDENSERS
T810	Acme '.0005 Vernier\$5.65
T784	Coto .00025 Vernier 3.95
T785	Coto .0005 Vernier 4.25
T786	Coto .001 Vernier 4.95
T787	Cardwell .00025 3.95
T788	Cardwell .00035 4.35
T789	Cardwell .0005 4.60
T790	Cardwell .001 5.55
T791	Marco .00025 3.95
T792	Marco .00035 4.45
T793	Marco .0005 4.95
T794	Marco .001 5.85
T795	Flewelling .00025 Vernier 4.50
T796	Flewelling .0005 Vernier 4.95

ne B	You take no risk in dealing with us. We are one of the oldest rest reliable reading with us. We are one of the oldest rest year reliability we refer test year. Let us serve you and save money for you. All orders shipped same day realized. ORDER DIRECT FROM THIS PAGE. You will find many items you will need on this page. Sand your order in for them at years and the same rest in
	CONDENSERS These are especially high grade condensers and we guarantee them to be mechanically and electrically perfect. Fine polished end plates of heavy bakelite. Shafts ½ inch diameter. Sturdy, he avy a dumminum amooth, even reliable capacity. Dial and knob on vernier type. No dial on plain type. Our low prices save you money. No. Max. Plain Type Vernier Type
	Plates Cap. Mo. Price Mo. Price 3 7815 8.79 8.76 8.70 9 10.0025
	ABLE CONDENSERS T99 0003
	num plates. Well insulated. STANDARD BRAND VARIABLE CONDENSERS
e y e -	7810 Acme : 0005 Vermier
00000	OUR SPECIAL A. F. TRANSFORMER TS49 3 to 1 ratio\$2.25 T550 5 to 1 ratio\$2.25 In quality of tone and rolling of sound, the things a transformer is outle for, we guarantee outle for, we guarantee under transformer. Neat in appearance. Carefully made. Fully mounted with plainly marked binding post connections. Wonderful results on one, two or three steps without distortion or howl- nig. A quality item in every respect.
	THER STANDARD BRAND AUDIO FREQUENCY TRANSFORMERS FREQUENCY TRANSFORMERS FREQUENCY TRANSFORMERS Fresh, Clean Stock in Original Containers. TS87 Thordarson Ratio 3½ to 1 33.30 Thordarson Ratio 6 to 1 3.70 TS88 Thordarson Hatlo 2 to 1 S.70 TS89 Thordarson Push Pull. Pair. 1.25 TS99 Thordarson Push Pull. Pair. 1.25 TS99 Thordarson Push Pull. Pair. 1.25 TS91 TS92 TS91 TS92 TS92 TS92 TS93 TS91 TS91 TS91 TS92 TS91 TS92 TS91 TS92 TS91 TS9
ı	\$TANDARD BRAND RADIO FREQUENCY TRANSFORMERS 1582 Dubliler Duratran 3.45 1584 Acme R2 3.95 1564 Acme R3 3.95 1567 Acme R4 3.95 1568 Erla Reflex No. 1 4.45 1579 Erla Reflex No. 2 4.45
1	RESISTANCE COUPLED AMPLIFI- CATION T570 1st Stage Unit \$2.30 T571 2nd Stage Unit 2.30 T572 3rd Stage Unit 2.49 Amplifies without distortion. Replaces audio frequency transformers using same circuit. Each unit consists of a mounting with condenser, grid cak and resistance of proper value for pest results.

	*******	***			-	•	*			_	**		70		
F	REQUEN	CY	T	R	48	V:	SI	F) (8	M	E		18	3
T562	Dubilier	Du	ıra	tre	ın										\$3.45
T595	Acme R2														3.95
T560	Acme R3											į.			3.95
T567	Acme R4														3.95
T568	Erla Ref	lex	N	0.	1										4.45
T579	Erla Ref	OT	N	n	2										A 45



BUY DIRECT FROM THE MANUFACTURER

THE FAMOUS 5-TUBE A. & P. STANDARD NEUTRODYNE



7"x24" \$4.95 extra)

THE NON-RADIATING, NON-SQUEALING, NON-HOWLING SET THAT HEARD ALL EUROPE DURING RECENT INTERNATIONAL TESTS. COMPLETE WIRING DIAGRAM AND DRAWING FOR PLACING OF PARTS FURNISHED WITHOUT EXTRA CHARGE. TUNES TO HIGH AND LOW WAVE LENGTHS AND STATIONS CAN BE FOUND REGULARLY ON SAME DIAL READINGS. ALL PARTS MADE IN OUR FACTORY ACCORDING TO NEUTRODYNE SPECIFICATIONS. FULLY GUARANTEED. THE PARTS ARE AS FOLLOW:—

- ARE AS FOLLOW:—
 3 Variable Condensers, highest grade, capacity, .00375
 3 heutro-Coils, silk wire wound on genuine bakelite
 tubing
 6 Meuntine Bracketa
 Peutralizing Condensers (set of parts with glass
 Dielectric)
 1 20 Ohm Rhecotat (Bakelite)
 1 6 Ohm Rhecotat (Bakelite)
 2 Shielded Audio Transformers
 3 4-ineh "Vernigrip" dials
 3 Improved Zere Capacity Jacks

- 3 Mica Fixed Condensers (capacities .006, .001, .00025)
 I Tubular Grid Leak
 Grid Leak Mountings. Bakelite binding post strip.
 7 Binding Posts
 II Lengths Bus Bustli
 Lengths Bus betti
 all sarts at cerreet angles, including jacks
 Blue Print (large, with complete and simple Diagrams)
 I Copper sheet (for shielding)
 I Print for piacing parts
 I Specially-treated base board
 PROMPT ATTEMTIAN

MAIL ORDERS GIVEN PROMPT ATTENTION

ATLANTIC & PACIFIC RADIO CORPORATION

New York City 223 West 34th Street



RADIO REPRODUCTION

MULTIPLE ELECTRIC PRODUCTS CO., Inc. 363 Ogden St., Newark, N. J. (Dept. W.)

New York Philadelphia Boston Baltimore Detroit Pittsburgh Chicago St. Louis San Francisco St. Louis San Francisco
Marconi Wireless Telegraph Co.
of Canada, Ltd.
Bole Canadian Distributors



The ATLAS Unit with adjustment and compound diaphragm -the heart of the ATLAS Speaker. "It gives the best that's in your set."

ATLAS Products are guaranteed





Let Boice Help You Build It!

Boice-Crane JUNIOR SAW

olce-Crane machine on monthly payments. He gives ed values at lowest prices with a positive money-e. Machine shown will saw, sand, grind, miter, etc. Sturdy, accurate, economical, Saws 1½" stock.

Pay you unsurpassed values at lowest prices with a positive manage back guarantee. Machine shown will saw, sand, grind, miter rabbet, tenon, etc. Sturdy, accurate, economical. Saws 1½" stock Sold with or without moti.

W. B. & J. E. Boice, "World's Largest Makers of Small Bench Machines".

TOLEDO, OHIO



BAKELITE PANELS

Used by 95 per cent of all set manufacturers. Write for Booklet 24

BAKELITE CORPORATION 247 Park Avenue, New York, N. Y. Chicago Office: 636 West 22d Street

DUOTRON Floating Battery Charger

Durkee-Thomas Products Co. 1228 Folsom Street - San Francisc 115 West 16th Street - Los Angeles

Due to what is termed "asymmetrical action" in the tube, the oscillator tube is capable of producing a "second harmonic," or second frequency B-2, which is very much weaker than the fundamental. (The need for utilizing the 8-cycle harmonic of 4 cycles rather tha producing a fundamental of 8 cycles will be stated below.)

The second harmonic of any frequency is just double that number of vibrations (1/2 the wavelength) in a given time.

B-2, the second harmonic, consists of 8 cycles (i.e., twice x 4). When these 8 cycles are caused to heterodyne (to be added to) the A-2 frequency of 9 cycles, the difference is only 1 cycle. This beat frequency of 1 cycle is the same as the adjustment of the filter coupler which is designed for 1 cycle.

for 1 cycle.

C-2 is the beat frequency or intermediate frequency which has been reflexed into the grid circuit of the first tube, which now amplifies once more. The output, C-3, of this tube is stronger than C-2 and considerably more powerful than the original incoming signal A.

The output, C-3, continues on to other tubes which act consecutively to further amplify at the intermediate frequency, detect, then amplify at audio frequency.

audio frequency.

Explanatory Circuit.

Q-2115-B is a schematic circuit illustrating the system. The 50-turn coil may be the secondary of a standard aerial tuning coil wound with No. 22 or 24 D.C.C. wire on a 3-inch tube. The primary may be wound directly over the filament end.

ment end.

The two honeycombs are in variable inductive relation and must not be in inductive relation to other coils in the set.

The 500-turn honeycomb coils and the two variable condensers comprise the standard filter coupler which, when Giblin-Remler coils are used, will respond to wave-lengths between approximately 1,730 and 7,900 meters. If intermediate frequency transformers are used having a higher wave-length, it will be necessary to connect two fixed condensers, each of .001 mfd. capacity, in parallel to each of the .001 mfd. variable condensers.

If we consider an extend wave transformer are condensers.

If we consider an actual example of an incoming signal having a frequency of 500,000 cycles (600 meters), to which the 50-turn coil and its variable condenser are tuned, and an intermediate frequency amplifier and filter coupler tuned to 50,000 cycles (6,000 meters), it becomes necessary to heterodyne some frequency with the incoming signal frequency in order to produce a difference of 50,000 cycles.

of 50,000 cycles.

Adding 50,000 cycles to 500,000 cycles we derive a total of 550,000 cycles (554 meters), the frequency required of our oscillator.

If the oscillatory circuit now including the 125-turn honeycomb coil were to include a much smaller honeycomb coil instead, so as to cover practically the same wave-length range as the broadcast stations, in the same manner as the regular oscillator system of a Super-Heterodyne, a peculiar effect would be noted; it would not be possible to adjust this circuit so as to heterodyne with the incoming signal without de-tuning the input circuit. Inversely, it would not be possible to tune the input circuit without de-tuning the oscillator circuit.

It is an entirely different matter when the

the oscillator circuit.

It is an entirely different matter when the wave-length range of the oscillator circuit is placed considerably outside the operating range of the input tuning circuit, which is accomplished by doubling the wave-length; tuning the 125-turn honeycomb circuit designed for this new wave-length range no longer has any appreciable detuning effect on the input circuit.

Our heat frequency, we have decided is to be

tuning effect on the input circuit.

Our beat frequency, we have decided, is to be about 50,000 cycles. The asymmetrical tube action mentioned above causes our oscillator to produce the desired frequency, which will result in a beat of 50,000 cycles. Granting an arbitrary incoming signal frequency of 500,000 cycles (600 meters) and the requirement of an oscillator frequency of 550,000 cycles (545 meters) the 125-turn honeycomb coil circuit is tuned to 275,000 cycles (1,090 meters). Tuning this circuit does not appreciably affect the input tuning, while the second harmonic of 1,090 meters occurs at the required 545 meters (550,000 cycles).

Remember that these figures are used only for

Remember that these figures are used only for illustrating the principle. They will be different for every wave-length received and for the different intermediate frequencies for which the set may be designed.

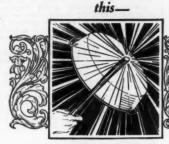
Experimental Circuit

Circuit Q-2115.C shows a complete set having one stage of short-wave amplification (tube No. 1), first detector (tube No. 2), oscillator (tube No. 2), first intermediate frequency amplifier (tube No. 1), second stage of intermediate frequency amplification (tube No. 3), second detector (tube No. 4), and one stage of audio frequency amplification (tube No. 5)—seven operations being performed with five tubes.

In this circuit the instrument marked R.F.T. (B.W.) can probably be a regular radio frequency transformer, air core, designed to cover the broadcast wave-lengths.

We are showing a "C" battery in the oscillator be circuit. This tube must act as detector as tube circuit.

Does Your Radio Make Music Sound like-







or this

TONE plus desirable OVERTONES Tone color—REAL music)

In Radio, people want Distancebut they want TONE even MORE

Without Desirable Overtones You Get no Rich, Resonant Voice nor Tonal Beauty How Pfanstiehl Reproduces Most Delicate Overtones

ANY good radio set can get distance, simply by amplification. There is no distinction about that. To get tone quality is quite another matter. And tone quality is the real measure of radio reception. Radios differ in this respect just as pianos differ. You judge a piano by its ability to produce a beautiful tone. You judge a radio by its ability to reproduce a beautiful tone, from a distance.

In a piano, quality of tone depends upon the manner in which the overtones are produced and controlled. Without them you could have no richness or beauty of tone. You would have a colorless, uninteresting sound. You can get beautiful piano music only from a fine piano in the hands or a good performer. Paderewski himself could not get tonal beauty out of a poor piano.

Overtones Perfectly Reproduced

In radio you have a similar situation. It cannot receive a lovely voice or beautiful music unless it reproduces the overtones which make it beautiful, exactly as they are sent out in delicate vibrations from the transmitting station.

That has been an extremely difficult thing to do in radio

reception, simply because radio engineers have not known how to control the forward stream of radio energy as it passes from circuit to circuit in the set. Some of the energy strays off and feeds back. That is what causes the uncanny noises you hear, noises which have to be choked down or neutralized by a lot of complicated devices, and these distort and spoil the delicate super-vibrations which make overtones in your reception. Your tonal beauty is gone, in exactly the degree that your overtones are distorted or suppressed.

The matchless beauty of Pfanstiehl tone lies in the utter absence of feedback to disrurb the delicate super-vibrations.

which make the overtones. These come through INTACT. There is no distortion whatever. The tone is full, rich and clear. You can enjoy exactly as transmitted the vocal charm of a beautiful singer or the tone color of a great violinist.

What an immeasurable advantage that is! Distance, selectivity, volume, portability, are all values in radio which people want and can have to the extent that the

maker chooses to afford them. There is no special problem about that. Radio science knows bow.

The Big Problem in Radio Is Tone Beauty

The big problem in radio is tone beauty, a full and true reproduction of voice or music EXACTLY AS TRANS-MITTED. This problem has been fundamentally solved in the Pfanstiehl. It gets the same distance, selectivity and volume as other high-grade 5-tube receivers; but in tone it is

matchless, for the reasons above given.

Hear the new Pfanstiehl Overtone Receiver at your radio or music dealer's. If he does not have one we can quickly get it to him.

Pfanstiehl Radio Co. Sales Offices: Dept. C. 11 S. La Salle St. CHICAGO, ILL.







OVERTONE RECEIVER





KIC-O "B" Multi-Power Unitthe power behind better radio reception

How did the concert come in last night? Did you have to disappoin your guests because of poor reception due to an unsatisfactory "R battery? Then let the new KIC-O Multi-Power Unit end your rad troubles now.

troubles now.

This new unit combines one Multi-Polar recharger and one heavy capacity nickel-zine alkaline storage "13" battery into a compact, durable, well built power unit that will last for years.

Its ease of operation will please even the most exacting radio fan. Just attach to any electric light socket and forget it. When you desire to receive throw the panel switch up. For recharging throw the switch down. No bother, no worry—a simple twist of the wrist.

Each unit bears a printed guarantee of protection against electrical and mechanical defects.

Write today for full description which tells why KIC-O Multi-Power units are better than dry cells, "B" eliminators and acid "B" batteries.

	PRI	CES	
PZ indi	cates panel		switches.
Voltage	M.A.H.	Type PZ	Type CZ
130	2500	\$36.60	\$33.00
100	2500	27.50	24.50
70	2500	21.50	18.50
45	2500	16.00	14.50
221/2	2500		7.50
	Multi-Por	wer Units	
(No recharg	er require	d)
130 volt			
100 volt			35.00

KIMLEY ELECTRIC CO., Inc., 2665 Main St., Buffalo, N. Y.



"HELLO, BILL, HOW'S BUSINESS?"

Ton was a friend of Bill. And Bill was a friend of Ton. Both were radio dealers. They met one day returning from the Business Mon's Tuesday Lunchecs. Says Tom:
"Holle, Bill, how's business," "Reften," growded Bill. "I can't get any deliveries from my wholesaler."
"Who is your wholesaler?" asked Tom. "The Blank people," came the answer.
"Now, old man," Tom put in, "listen to what I tell you. You connect up with that HOMMEL organization—just as I de.
"If you are a HOMMEL dealer you'll get your deliveries even if no one else is. And co-operation! Why. say, they sont me a couple of consumer inquiries—they always refer inquiries to their dealers—that brought me a sale of \$200. and another one of \$400. That's gaspet truth, Bill.
"Get their Encyclopedia of Radio Apparatus—266-5. That describes their complete Line." Bill followed Tom's advise—and stopped werrying about "retten" deliveries and business.

EXCLUSIVELY

10

929 PENN AVENUE -





NEW MODEL C-7 SUPER-HETERODYNE THE SET THAT MADE RADIO FAMOUS

The greatest set known for long distance, volume and quality of reception.

The Model C-7 is the result of many years' work by the best known radio engineers, and is made up of the highest quality apparatus available. It is the most sensitive and most selective broadcast receiver that can be built.

We distribute only the original E. I. S. parts and make immediate shipment from stock. Write for catalog and price list.

RADIO PARTS CO.—Laboratories

8 South Austin Blvd.

OAK PARK, ILL.

Insure your copy reaching you each month. Subscribe to Radio News-\$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

well, and, therefore, it may be advisable to tryconnecting a grid condenser and leak, or a crystal
detector, at "X."

Although iron core intermediate frequency transformers I.F.T., 1, I.F.T. 2 and I.F.T. 3 are shown
(if the experimenter has a set of Tropaformers,
they will readily adapt themselves to many experiments with this circuit), it is possible that
air core transformers which amplify best at
about 6,000 to 8,000 meters could be used.

It will be noticed that the primary I.F.T. 1 is
connected into the circuit in a different manner
than usual. It is a particularly efficient method
of connection in this circuit.

The second harmonic Super-Heterodyne is generally conceded to be the most difficult type of
receiver to construct outside of the laboratory.
Only a skilled engineer can hope to successfully
build a set incorporating this particular principle.

For further information on the second harmonic
Super-Heterodyne, we refer the experimenter to
the May, 1924, issue of Radio News, page 1576,
the "Proceedings of the Institute of Radio Engineers" of October, 1924, page 539, and "Wireless
Age" magazine of April, 1924, page 30.

Lessons in Esperanto

(Continued from page 2056)

the material indicated in the root. the material indicated in the root. It gives a definite quality to the root. Bovo, a bull, or ox; bovaĵo, beef. Ovo, egg; ovaĵo, omelet. Manĝo, a meal; manĝaĵo, the food for a meal. Bono, good; bonaĵo, a good action. Li faris al mi bonaĵon, He did me a good act. Heroa, heroic; heroaĵo, a heroic exploit.

-An., -ist., -estr., -ul. These four suffixes relate to individuals. When combined with a root, one or other of them

serves to show a person's country, religion, profession, occupation, character, etc. Each has its distinct meaning, and care must be taken not to confuse them. The feminine suffix -IN- is added to denote females. -An- indicates a member of something, such as a club, society. etc.; an inhabitant of a place or country; a partisan, or adherent to some party, faction, religion, etc. Klubo, a club; Klubano, a club member; Senato, senate; senatano, senator. Ameriko, America: amerikano, an American (words indicating people of a country are generally written with small letter). Kristano, a Christian.

-Ist-, like the English affix -ist, denotes a person following a profession or trade, or-some occupation by which he gains his livelihood, or who is habitually engaged in science, art, etc. It denotes a person's occupation, not something they do occasionally. Instruisto, a professional teacher; instruanto, one who teaches occasionally, but not as a profession. Suo, shoe; ŝuisto, shoemaker.

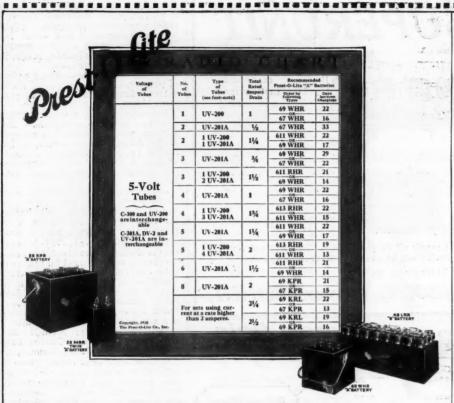
The person doing a thing occasionally, as an amateur, such as instruanto, is indicated by the participle. Juĝanto, a person judging something; juĝisto, a judge by profession. Rajdanto, a rider; rajdisto, a jockey.

-Estr- denotes a person who is a chief. leader, ruler, head of a state, party, any organized body, etc. As -an- denotes a member, partisan, etc., of some body, profession, etc., so -estr- designates the head, or leader: Urbo, a city, urbano, a city inhabitant; urbestro, mayor. Lernejo, inhabitant; urbestro, mayor. Lernejo, school; lernejestro, principal of a school. Imperio, empire; imperiestro, emperor: imperiestrino, empress. Ŝipo, ship; ŝipestro, captain of a ship. (For military captain use Kapitano.) (For naval or

Cefo, chief, is used in a few words as a prefix with a similar meaning to -estr-: Episkopo, a bishop; ĉefepiskopo, arch-

bishop.
-Ul- indicates a person characterized by the idea contained in the root to which it is attached. By it we express that an

.........



How to select batteries that run your set for weeks without recharging

Why select storage batteries by guesswork and risk getting one that requires charging every few days? Buy wisely. Let the Prest-O-Lite Radio Chart guarantee you batteries that fit your set—of ample capacity to bring weeks of fine reception without too frequent recharging.

The above section of the master chart selects Prest-O-Lite "A" Batteries to fit all 5-volt sets. It recommends two sizes for each set, depending upon the days of service you wish between chargings (based on the average use of your set of three hours a day). The larger capacity battery will be found more desirable unless facilities for frequent and easy recharging are provided. Consult the complete chart

at your dealer's for data on "B" Batteries and also "A" Batteries for low voltage tubes.

In every detail of construction—special structure plates, highly porous separators and superior internal design—these batteries are made to get the best out of your set. To supply the dependable, unvarying current essential to fine tuning, efficient tube operation and clarity of reception.

Prest-O-Lite Batteries offer you truly remarkable savings. Though standard in every respect they are priced as low as \$4.75 and up. They last for years and are all easily rechargeable. See them at your dealer's or write for our booklet, "How to fit a storage battery to your set—and how to charge it."

THE PREST-O-LITE CO., INC., INDIANAPOLIS, IND.

New York San Francisco In Canada: Prest-O-Lite Company of Canada, Ltd., Toronto, Ont.



Write today for this free booklet

Whether you have a one-tube set or most advanced multi-tube outfit, you'll find a fund of interesting information in our booklet, "How to fit a storage battery to your set—and how to charge it."

This booklet gives you the complete Prest-O-Lite Radio Chart-technically accurate recommendations covering both "A" and "B" storage batteries for every type of set.

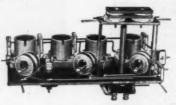
In addition, there is much vitally important data on battery care and upkeep—information that any radio fan will find of real value in keeping his set at its maximum efficiency. Write us at Indianapolis, Ind., for your copy right now.



THE SUPERUNIT

Type A For standard base tubes.

> Type B For 199 and 299's.



With complete instructions and wiring diagram \$37.50

A tested four tube assembly with an unusual reception range. By adding tuning condensers and audio frequency stages you can build a six tube set that will cover the continent on the loud speaker.

The Type B Superunit is particularly adapted for portable sets. We guarantee that the "B" battery current for a six tube set using the Superunit will not exceed ten milliamperes, and the set can be operated on a "B" battery eliminator.

For \$75 we supply all the parts with drilled panel and base. Two styles, straight panel or sloping panel. Loops for the set, \$8.50.

ALLAN T. HANSCOM, Woonsocket, R. I.



Standard Tipe shown below same Universal



The Wood screw "B" inserts in the wire core of the cord until the head scats (see B-2) making an excellent electrical contact. This screw also wedges the cord out into the internal thread of "A" making a firm mechanical ioint

The Barkelew Electric Mfg. Co. Middletown, Ohio, U. S. A.

g a firm mechanical joint.

All parts are of brass, nickel plated.

A CORD TIP that requires no solder, no wrap-ping of the insulation and no tools other than a pen knife and a small screw driver. Any-one can attach it quickly and have a factory finish.

The internal thread of the Universal Sleeve "A" draws inside all loose ends of insulation.

See our Bulletin No. 36 at your Dealers. If he hear't his copy, we have one for him

CHICAGO, IS S. Clinton St.
INCHIVES. Denborn Bidg

SEATTLE, 1641 State Ann. S.
ANN PRANCISCO, 73 Freeman St.
LOS ANNEADOLES. 1617 Lumber St.
LOS ANNEADOLES. 461 S. San Pubro St.

A.P versal Sierve "A" has an 7/ 200 Surev on any of our econderic crew Grip Tipe shown at left.

AMBASSADOR Low Loss Products



High grade, standard radio products that will increase the efficiency of any set and add to the satisfact of the fiser. Ambassador Low Loss than to long been the choice of gas the nation of the fiser. The compare them, will become them to make the content of th

ficular fans. See them—compare been, and you will choose them too.

At all good dealers.

Write for FREE diagrams of circuits in which Ambassader products can be used. AMBASSADOR SALES COMPANY 108 Greenwich St. New York 225 W. Madison St. Chisage

M & M-INSULATORS



brass center.

The M. & M. Co., Soo Prospect Avenue Cleveland, Ohio

Insure your copy reaching you each month. Subscribe to Radio News-\$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

individual is "rich," "poor," "bad," "good," etc. Riculo, a rich man; riculino, a rich woman; malriculo (see prefix mal-) a poor man; bonagulo, a good fellow; malbonagulo, a bad, selfish fellow. Juna, young; junulo, a youth; junulino, a young woman; maljunulo, maljunulino, an old man, an old woman.

Suffixes -ar- and -er-. Aro, a collection of persons, or of objects all of the same nature. Ero, an item, a small part of

some bigger whole.
Examples: Vorto, a word; vortaro, a collection of words, a dictionary; Homo, a human being; homaro, humanity, mankind. Arbo, a tree; arbaro, a forest; insulo, island; insularo, archipelago; vagono, a railway coach; vagonaro, a train: ŝtupo, stairstep, doorstep; ŝtuparo,

-Er-. Sablo, sand; sablero, a grain of sand. Mono, money; monero, a piece of money, a coin. Hajlo, hail; hajlero, a hailstone. Fajro, fire; fajrero, a spark. Neĝo, snow; neĝero, a flake of snow.

Suffixes -ĉj- and -nj-. -Ĉj- is an affectionate diminutive to the first name of a tionate diminutive to the first name of a person. It is substituted for one or more letters of the name: Vilhelmo, William: Vilhelĉjo, Willie; Vilĉjo, Billy; Vilĉjo, Bill. Petro, Peter; Petĉjo, Pete. Johano, John; Johanĉjo, Johnny; Joĉjo, Jack. Patro, father; paĉjo, papa, daddy. -Njis a similar diminutive for a female first name: Mario, Mary; Marinjo, Mollie: Klaro, Clara; Clarinjo, Clarrie; Patrino, Mother; Patrinjo, Panjo, Mamma, Ma.

Suffixes -ebl-, -em-, -ind-. These three suffixes, when used as roots, for the words ebla, possible; emo, propensity, tendency; indo, worth, merit, value. As suffixes they are mostly used to form adjectives or adverbs, and the following three, from kredi, to believe, will give an idea of the difference in their shades of meaning:

Kredebla, credible, possible of belief, believable;

Kredema, credulous, having a tendency to believe;

Kredinda, something worthy of belief. -Ebl- denotes possibility, or what is likely to happen, similar to the English suffix -able, or -ible. Examples: Pagi, to pay; pagebla, payable. Fleksi, to bend; fleksebla, flexible. Fidi, to rely upon, have faith in; fidebla, reliable. Kompreni, to understand; komprenebla, comprehensible; compreneble, of course, comprehen-

sibly.

Do not confuse -ebl- with -em- or -ind-in words which in English end in -able or -ible, but have two distinct meanings. For instance, from senti- to feel, to ex-perience, we get sentebla, susceptible or sensible, and also sentema, susceptible or sensitive. "Readable" may mean either "able to read" or "worth reading." In Esperanto there is no such confusion, for legebla, readable, legible, but leginda means readable, worth reading. Hence means readable, worth reading. Hence we see that -ebl- must always mean pos-

-Em- denotes propensity, tendency, in-clination, or disposition toward a certain way of doing or thinking, similar to the English suffix -ful. Examples: Paco, peace; pacema, peaceful. Helpi, to help; helpema, helpful, obliging. Trompi, to deceive; trompema, deceitful; trompemo, duplicity. Pura, pure; purema, cleanly; purigebla (see suffix -ig-), cleanable.

-Ind- denotes worthiness, worthy of. Examples: Inda, worthy; malinda, un-worthy; laŭdinda, laudable, praiseworthy. from laudi, to praise. Estimi, to esteem; estiminda, esteemable, worthy of esteem.

Suffix -edz-. This suffix always denotes married person. It can scarcely be



ANNOUNCING THE OPERADIO CONVERTIBLE

A De Luxe Cabinet Housing the Powerful Operadio Portable

The remarkable success of the 1925 Operadio, a six tube set of exceptional efficiency in a compact carrying case, has led to another new and revolutionary development.

Operadio engineers, in conjunction with leading designers of fine furniture, have evolved two dignified and beautifully proportioned walnut cabinets to house the portable set when used in your home.

These two Period models, graceful of line and unique in design, provide a worthy interior setting for this most talked of receiver of the year, with its features of great power and efficiency and wonderful tone quality.

Now in this one set there is every desirable feature of radio. In the home you may have a cabinet of unprecedented beauty that uses no outside wires or connections, no separate loud speaker.

Or by removing the set, you have a complete, self-contained receiver with loud speaker, six tubes, large battery supply and all parts enclosed in a smart-looking case, ready for you to carry with you on trips or vacations.

The Operadio has shown itself in every way the equal, if not superior, of any big set on the market.

Range, selectivity, ease of tuning, clear, true, beautiful tone, all of these are here, and in addition, its amazing convenience—permitting radio to be enjoyed anywhere, indoors or out, upstairs or down.

You can buy the Operadio Convertible in either Windsor or Empire Model. Or you can buy the standard set in the carrying case alone.

And if you now own the 1925 Operadio you can secure one of these beautiful cabinets in which it may be placed. Ask your dealer—or write us direct



The 1925 Operadio removed from cabinet and ready for use. The cover is the aerial; the case may be closed and carried like a piece of hand lugage.

Mail the Coupon

THE OPERADJO CORP., 8 South Dearborn St., Chicago, Ill. Please send me complete particulars about the 1925 Operadio.

Name	
Address	
City	State



It's easier to move the horn than the entire set. Haven't there been many occasions when you've wished you could?



Solves the riddle! It will not break, kink, fade or reduce the volume. Doubles your radio enjoyment. Price \$1.75 with connecting plug.

> At your dealer's or write us.

CRESCENT BRAID CO., Inc. Providence, R. I.



Write For Discounts on

BURNS
BREMER-TULLY FROST
DUBILIER
DUBILIER DAVEN

FEDERAL SHAMROCK

and Other Standard Lines

PRAIRIE STATE RADIO CO.

39 W. Adams St., Chicago, Ill.

READ THIS

called a suffix since it is generally used as a root. Examples: Edzo, husband, a married man; edzino, wife, a married woman; edzeco (see suffix -ec-), matrimony, a state of marriage; edziĝo (see suffix -iĝ-), a wedding, nuptials; geedzoj (see prefix -ge-), a married couple, husband and wife; edziĝi, to become married. Mia edzino kaj mi edziĝis antaŭ dek jaroj.

Suffixes -eg- and -et-. These two suffixes are opposites, -eg- indicating augmentation, and -et- diminution of degree. When these suffixes are attached to adjectives, the adverb "very" often is erroneously used to translate the meaning of degree of these affixes, as: Grandega, very large; malgrandega, very little; but the proper translation of these words is grandega, huge, enormous; malgrandega, tiny. Never think of the meaning of these affixes in terms of "very," but in terms of "excessive," "enormous," "ex-tremely." Examples: Montego, a huge mountain; granda monto, a big mountain; monto, a mountain; malgranda monto, a small mountain; monteto, a hill. Riverego, a huge river; larga rivero, a wide river; rivero, a river; malgranda rivero, a small river; rivereto, a creek, a brook.

The suffix -et- is sometimes used to indicate endearment: Etulino, dear little girl (made up from -et-, -ul-, and -in-, with the noun ending -o attached); etulo, dear little fellow; eta panjo, little mama;

eta paĉjo, little daddy.

LESSON 8 AFFIXES-(Continued)

Suffixes -ej-, -ing-, and -uj-. These suffixes are similar, since they indicate either a place or thing from which the idea of the root is produced, or in which it is contained.

Ej- denotes a place especially used for, or allotted to, the idea contained in the It is also used as a root word, itroot. self: Ejo, a place, locality. Examples: Safo, sheep; ŝafejo, sheepfold. Preĝi, to pray; preĝejo, a church, a place used for prayer. Fruktarbo, a fruit tree; fruktarbejo, an orchard, place of fruit trees. Lerni, to learn; lernejo, a school. Dormi, to sleep; dormejo, a dormitory.

-Ing- denotes a thing made to hold only one object indicated by the root. It is also used as a root word: Ingo, a socket, a sheath, a holder. Examples: Kandelo, a candle; kandelingo, a candleholder; plumo, a pen; plumingo, a penholder; fingro, a finger; fingringo, a thimble; glavo, a sword; glavingo, a scabbard. -Uj- denotes that which contains, pro-

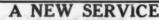
duces, encloses, or bears. Used as a root, Ujo means a receptacle, a container. has a wide signification, for it can be used for:

(1) The names of countries, as being the places containing their various races: Franco, a Frenchman; Francujo, France; Ruso, a Russian; Rusujo, Russia; Japano, a Japanese; Japanujo, Japan (-lando and -io are also used: Ruslando, Russia; Germanlando, Germany; Rumanio, Rouma-nia; Italio, Italy; although the latter, -io, has not been authorized by the Academy and is used only sparingly in transient matter, such as newspapers. It is recommended for its euphony, though there are arguments against it).

names of trees producing The fruits: Pruno, a plum; prunujo, a plumtree; piro, a pear; pirujo, a pear tree. Arbo can also be used with any of the above roots: Pirarbo, pear tree; ĉerizarbo,

cherry tree.
(3) The names of receptacles commonly used for certain articles: Mono,





A NEW SERVICE
The BROWN TUBE REVIVER rejuvenates
worn down tubes in 10½ minutes. An opportunity for you to immediately establish a profitable
and substantial business,
full or part time. This new
absolutely guaranteed instrument priced at
\$2.5.00 complete.
The first cost is The first cost is the last cost. BE THE FIRST IN YOUR NEIGH-BORHOOD. Send NOW for particu-Pat. Appl'd. For

THOS. BROWN CO. 513-517 Orange St.



Ford Runs 57 Miles On Gallon of Gasoline

A new automatic and self-regulating device has been invented by John A. Stransky, 260 Fourth St., Pukwana, South Dakota, with which automobiles have made from 35 to 57 miles on a gallon of gasoline. It removes carbon and reduces spark plug trouble and over-heating. It can be installed by any one in five minutes. Mr. Stransky wants distributors and is willing to send a sample at his own risk. Write him today.—Adv.



Write for our free booklet on

RUBBER

for more perfect

RADIO RECEPTION

It is filled with valuable hintstoradioenthusiasts.

cro

In building your set specify the following

GOODRICH RADIO PANELS

highly polished — hold their luster. Supplied in black or mahogany; easily worked with same tools as wood or metals. Guaranteed against excessive warpage.

GOODRICH V. T. SOCKETS

Only socket made where tube can be inserted and fastened or unfastened and removed without turning tube in socket. Locks automatically. Prevents tube breakage. Contacts automatically wiped when tube is inserted.

GOODRICH VARIOMETERS-UNWOUND

RADIOPHONE EAR CUSHIONS

SPAGHETTI TUBING BATTERY MATS Science has proved that rubber is best electrically—its dielectric loss is smallest of all known panel materials—but there are many different kinds of so-called rubber. Play safe and insist on Goodrich.

ielectric loss

We are specialists in rubber. We manufacture every conceivable rubber product, from great conveyor belts and automobile tires to rubber bands. There are fifty-five years of experience behind us. Quality is ever our first consideration.

Goodrich Rubber Radio Products are made particularly for the service they are called upon to meet—developed after long experiment and research.

Use them—for better reception, maximum selectivity and widest possible range.

Listen in on the Silvertown Cord Orchestra

Every Tuesday from 10 to 11 P.M. (Eastern Standard Time)—the greatest dance orchestra on the air. Tune in on the following stations:

WEAF, New York; WJAR, Providence; WFI, Philadelphia; WCAE, Pittsburgh; WGR, Buffalo; WEEI, Boston; WWJ, Detroit; and 9 to 10 P. M. (Central Standard Time), Stations WCCO, St. Paul-Minneapolis; WOC, Davenport; WSAI, Cincinnati (every other Thursday).

THE B. F. GOCDRICH RUBBER COMPANY
Established 1870
Akron, Ohio

Goodrich Rubber PRODUCTS



Cannon-Ball \$3.50

The quick pull and quick release of the cores in the Camco Cannon-Ball efficient coils help produce clear, sharp reception always. If you want tone, volume and qual-ity, a Camco Cannon-Ball Headset will meet your wishes. Light as a good headset should be-comfortable on any type of head. Inspect the Camco Cannon-Ball Headset at your dealers or write for folder.

Radio As You Like It

Camco Cannon-Ball: Cases, highly polished aluminum; Magnets, chrome mag-net steel; Cores, special alloy; Core Heads, Formica; Diaphragms, silicon Heads, Formica; Diaphragnis, steel; Wire, copper enamel insulation; Terminals, outside, positive side marked plus; Caps, black composition; Resistance, about 2,000 ohms D.C.; Turns, 4,500 per coil, 18,000 per set; Impedance, about 20,000 ohms at 1,000 cycles; Cords, black mercerized cotton, 5 feet long; Head-bands, adjustable type, wire covered with black braid; Weight, complete with headband cord, 10 ounces

Compare Camco Cannon-Ball and Camco Grand Headsets. Then choose the one you like best. Both are sold on a MONEY-BACK GUARANTEE.



DEALERS: Ask your jobber about Came products or write for complete details

CANNON & MILLER CO., Inc. SPRINGWATER, N. Y.

FORMICA RADIO PANELS TUBES AND RODS

WRITE TODAY for your copy of our new catalog listing and pricing 3384 different sizes and kinds of Formica Radio Panels, 126 differ-ent sizes of Formica Tubes, and 21 different sizes of Formica Rods.

DRILLING-ENGRAVING

STARRETT MFG. CO. 520 S. Green St. Chicago, III.

5000 RADIO DEALERS buy from HUDSON-ROSS 123 W. Madison St. Chicago money; monujo, a purse; papero, paper; paperujo, a portiolio; sukero, sugar; sukerujo, a sugar bowl; karto, a card; kartujo, cardcase; abelo, a bee; abelujo,

Suffix -id- denotes the young of a species, the offspring, or descendant. Used as a root, ido means offspring, descendant, a baby of, used more often in reference to the young of animals than of humans; idaro, a collection of offspring, posterity of a race or individual. Examples: Kato, cat; katido, a kitten; hundo, dog; hundido, puppy; ĉevalo, horse; ĉevalido, a colt: Izraelo, Israel; izraelido, an Israelite; reĝo, a king; reĝido, a prince (though the international word, princo, is used for prince, as all princes are not the sons of kings).

Suffixes -ig- and -ig-. These two are the most important and most widely used of all the suffixes, as they form an infinity of words, especially verbs. As roots they can mean: Igi, to make, to cause to do something, as: Igu ŝin veni al nia dancado, Make her come to our dance.

Li penis igi sian amikon veni, He tried to make his friend come. Iĝi, to become, to make oneself become, or do a thing.

La vetero iĝas pli varma, The weather is becoming warmer. Li baldaŭ iĝos riĉulo, He will soon become a rich man.

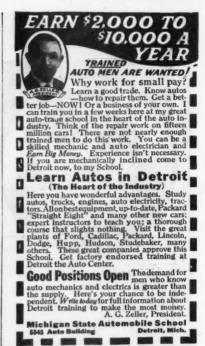
Used as suffixes -ig-denotes (like English suffix -fy) to make, to cause (by an exterior force) to become, as: ruĝa, red; ruĝigi, to redden, to make red, and from this is formed the noun rugigo, the act of reddening.

-Iĝ- denotes to become, to get into a certain state of being oneself, or from internal causes, not from external forces: Ruĝiĝi, to become red, to blush; ruĝiĝo, the action of getting red, a blush; ruĝiĝa, blushing (adjective).

These two suffixes can be applied to almost any part of speech. Examples: Bona, good; bonigi, to make good, to cause to be good; boniĝi, to become good. Plibonigi, to make better, to improve a thing; pliboniĝi, to become better, to improve oneself; plibonigo, the act of making anything better. Laca, tired; lacigi, to tire, to make tired; lacigi, to get or become tired. Preta, ready; pretigi, to make ready; pretigi, to get (become) ready; Pretigu vin por iri kun mi, Get ready to go with me. From all these verbs, nouns, adjectives and adverbs can be formed:

From Nouns: Fianĉo, a fiancé (man); fianĉigi, to betroth, to affiance; fianĉiĝi, to become betrothed, to become engaged to marry; fianĉiĝo, betrothal, engagement; fianciĝa, betrothal; fianciĝe, by betrothal. These words relate to the betrothal of a man, but in case of a woman, we add the feminine suffix, as: fiancino, fianĉinigi, fianĉiniĝi, fianĉinigo, etc

From Verbs: Morti, to die; mortigi, to cause to die, to kill; mortigo, killing; malicmortigo (lit. "malicious killing"), murder; mortiga, deadly; mortiganto, a killer; mortige, mortally. Memmortigo, suicide; memmortigi, to commit suicide. Sidi, to be sitting, to sit; sidigi, to cause to sit; sidiĝi, to seat oneself; sidigo, the act of causing to sit, seating; sidiĝo, the act of sitting down, or seating oneself. Li kondukis la vizitantojn al iliaj sidejoj, sed la sidigo de tiom da gesinjoroj estis tasko malfacila, ĉar la sidiĝo de eĉ unu sinjorino bezonas iom da tempo, kvankam ne tiom, kiom la sidiĝo de hundo, kiu ofte turnadas sin multefoje antaŭ ol s'diĝi, He conducted the visitors to their seats, but the seating of so many ladies and gentlemen was a difficult task, since the sitting down of even one lady needs some little





she-thru ine usual time at a w amperes, o to lovoits.

It's a real motor generator with no expensive bulbs to break—no chemicals to renew—no contacts to burn or fuse. It has sufficient capacity to charge several batteries in parallel.

Merely hook it to a light socket—Fully automatic—Needs no watching while charging—Cannot charge in the wrong direction—Regularly equipped with 110 volt, 60 cycle A.C. Motor, 6 to 10 volt Generator. Equipped for other service if desired. Lasts a life time. SATISFACTION GUARANTEED OR MONEY BACK

In writing for details and special prices, state service current and if Charger is to be used for "A" batteries only or both "A" and "B" Batteries.

THE OHIO ELECTRIC & CONTROLLER CO. 5907 Maurice Avenue Cleveland, Ohio





Special Sizes to Order at \$2.50 each When better resistances are made Dealers write for they will bear the Creecest label.

CRESCENT RADIO SUPPLY CO.

Jamaica, N. Y.

Bipe Organ of

Coud Speakers"



THOROLA 4 \$25

THOROPHONE . . . \$45
Powerplus Speaker (Storage Battery)

THOROLA 6 \$15

THOROLA 9 \$40

The Thorola 10-day Refund Warranty is a guarantee to every user that Thorola will fulfill every claim.



Without pure musical tone, how hollow is all else in radio! Distance and volume, yes. But only TONE can make them worth while.

Command MUSIC with your radio set. Equip it with Thorola loud speaker, and know the modern radio entertainment which needs no excuse before the most critical audience. Thorola elevated radio to the sphere of art, with betterments only Thorola brings.

The Thorola Controlled Mica Diaphragm, for tonal purity and volume, is to radio what the pipe organ is to instrumental music.

The exclusive Thorola Separix literally assorts sounds, preserving the shades and overtones which determine the timbre of song or instrument; the naturalness of voice.

The Thorola Synchronizer balances each Thorola with each individual circuit, as must be done for finest radio.

The whole Thorola reproducing unit, by its very size, suggests not only extreme volume, but utmost accuracy of reproduction due to precision design, which skimping does not permit.

Projecting the sound is the Thorola horn of Thorite, a neutral laboratory compound acoustically faithful beyond natural horn materials.

Thorola improvements are bound to better any radio receiver. Thorola volume permits tuning down for local stations, and brings in distant signals clear and strong. Thorola tone makes radio an ART. Hear it at your Thorodealer's.

REICHMANN COMPANY
1725-39 West 74th Street · CHICAGO





ON ONE TUBE

BIG FREE BOOKLET tells the story. California users of CROSS COUNTRY CIRCUIT hear Atlantic Coast, Canada, Mexico, Cuba and Hawaii. Our new plan makes this set easiest and cheapest to build. One hour puts in operation. One tuning control. No soldering. Any Novice can do it, BOOKLET FREE or complete instructions 25c.

WHAT USERS SAY

EAST—Am more than pleased with the parts ordered from you. The first night I hooked it up and received Omaha. Since then Minneapolis and Los Angeles. It works better without amplification than most sets with two stages.

—Donals, S. C. WEST—I am sending you a list of some of the out amplification than most sets will two stages.

—Donals, S. C. WEST—I am sending you a list of some of the stations heard on one tube: WSB, WGY, KDKA every night, PWX, WWJ, WTAM, WLW every night, CFAC, CHCB. Not long ago I purchased another set of parts from you and first night got WGR, Buffalo, and KDKA.

—Tone, Calif.

NORTH—Received coils OK today. If I have same results with these that I had with last will be wanting more. I am 1,500 miles from nearest station and have picked 56 to date. Chicago, Havana, Mobile, New Orleans and TWO IN ENGLAND.—Lunenburg, Canada.

Vesco Radio Co. OAKLAND, CALIF.

time, although not so much as the sitting down of a dog, which often continues turning itself round many times before seating itself. Sciigi, to cause to know, to inform; sciigi, to become informed, to become learned.

Verbs formed by -igi- are transitive, but those by -iĝi- are intransitive.

Suffix -il- denotes an instrument or tool by means of which something is done. As a root, ilo, a tool, an instrument, an implement, or a means of. Examples: Kombi, to comb; kombilo, a comb. Razi, to shave; razilo, a razor. Tranĉi, to cut; to shave; razilo, a razor. Tranĉi, to cut; tranĉilo, a knife. Haki, to hack, to chop; hakilo, an axe; hakileto, a small axe, a hatchet. Kudri, to sew; kudrilo, a needle: kudrilmaŝino, sewingmachine.

Suffix -in- denotes the feminine gender. As a root: Ino, a female; ina, female (adjective). Examples: Frato, brother; fratino, sister; patro, father; patrino, mother. Kuzo, a male cousin; kuzino, a female cousin. Avo, grandfather; avino, grandmother. Ĉevalo, horse; ĉevalino, a mare.

Safo, a sheep; safino, a ewe.
Prefix Bo- denotes relation by marriage: Bopatro, father-in-law; bopatrino, mother-in-law; bofrato, brother-in-law;

bofratino, sister-in-law.

Prefix duon- also is used to show relationship. The root, duono, a half, should properly signify only half-blood relationship, but as relationships of this nature are few, it is also applied to "step" relationships: **Duonfrato**, step-brother, or half-brother; **duonpatrino**, step-mother, etc.

Prefix pra- gives primordial meaning, referring to past times, often ancient times. In relationship it is like the English "fore-," "great," or "grand." As a root, praa, primeval. Pratempo, primitive time; prapatroj, forefathers, ancestors. Praavino, great-grandmother.

Prefix ge- denotes both sexes taken to-ether. The words are always in the plural, and the feminine suffix is, of course, never added. Examples: Edzo, of husband; geedzoj, husband and wife; gepatroj, mother and father, parents; gefratoj, brothers and sisters; gesinjoroj, ladies and gentlemen (used by public speakers in addressing a mixed audience), also is used for Mr. and Mrs. So and So.

Prefix dis- denotes a movement from a given point into all directions, as the same prefix in English dispersal, and separation, in the sense of rupture, breaking up into parts. Examples: Siri, to tear; disŝiri, to tear to pieces and scatter, ĵeti, to throw; disjeti, to throw about, scatter. Disiri, to go in different directions, to separate.

Prefix ek- denotes an action just begun, of short duration, sudden and momentary; Kanti, to sing; ekkanti, to begin to sing, or start singing; ridi, to laugh; ekridi, to burst out laughing; lumigi, to light up, make light; eklumigi, to flash on light; krii, to cry; ekkrii, to exclaim, to cry out; kapti, to capture; ekkapti, to seize. Ekpensi, to begin to think: Kiam mi ekpripensas ĝin--. When I come to think about it-

Mal-, perhaps the most important affix in Esperanto, needs little explanation. Where there are two ideas direct opposites in meaning, one is used as a root and to indicate the opposite, mal- is prefixed: Bona, good; malbona, bad; dolĉa, sweet; maldolĉa, bitter; luma, light (adj.); malluma, dark.

Re- is the same as the English re-, meaning "back," or "again: Reveni, re-turn (lit. "recome"); rediri, resay; reprodukti, reproduce.





Special Library of Information

RADIO PATENTS TRADE MARKS

JOHN B. BRADY

Ouray Building Washington, D. C.

Cable address: RADIOPAT

Telephone: Main 4806



Equipment Same Day Shipments



Put a Sound Heart In Your Radio Set!



MASTERTONE RADIO TUBES

Standard Guaranteed \$4.00 Tube - Now

\$2.00 ALL TYPES Fil. Volt

LIST \$4.00 - 50% \$2.00 A trial order will prove that they are the ideal tubes for all makes of receiving sets. want good, live dealers to handle these tubes. Write for our "Exclusive Agency Proposition."

Less 2 % 10 days to rated dealers.

MASTERTONE RADIO COMPANY Newark, N. J.



CONDENSERS

For Real Radio Reception Write for Literature

HEATH RADIO & ELECTRIC MFG. CO., 206 First St., Newark, N. J.

Insure your copy reaching you each month. Subscribe to RADIO NEWS—\$2.50 a year. Experimenter Publishing Co., 53 Park Pl., N.Y.C.

What Do YOU Know **1**

Chiropractor Using

Chiropractor Reading Spinograph Plate



ILL the answers to these questions satisfy you completely?

Answer them because what you discover may prove to be the turning point in your life. It is possible that in the answers you will discover hidden away OPPORTUNITY, and you will grasp it.

Are you perfectly satisfied with your work and income?

Would you like to make a change, or are you one of those persons who are afraid to get out of the rut?

Could you make good in a new field of work as a professional man or woman, knowing that you would be serving humanity by the change?

Have you ability to study a new profession and finish the job? Would you like to be a highly respected Doctor in your community and have people coming to your office for health?

What do you know about the NEVROCALOMETER ?

What do you know about Chiropractic?

Now, if you would like to know more about Chiropractic—know all about this successful new profession which has attracted the attention of more than 20,000,000 people, write today for further information.

You can be successful as a chiropractor if you want to be. There are many fine openings awaiting good chiropractors. The public is convinced Chiropractic is right—It Does Get the Sick Well. If you want to join this new profession send in the coupon today. The largest school of its kind in the world offers you a chance to become a successful chiropractor.

Send in the Coupon

The Palmer School of Chiropractic,
Davenport, Iowa.

Send me, without obligation, detailed information about your school and Chiropractic.

Chiropenetor Giving Adjustment SCHOOL of CHIROPRACTION

CHIROPRACTIC FOUNTAIN HEAD.

HOME OF (State

(Name)



Now you can UNDERSTAND RADIO!

Take the mystery out of itbuild and repair sets-explain the vacuum tube-operate a transmitter-be a radio expert!



1 VOLUME 514 PAGES

Leatheroid Edition

Compiled by HARRY F. DART

Formerly with the Western Electric Co., and U. S. Army Instructor

Technically Edited by F. H. Doane 100,000 ALREADY SOLD

This practical and authoritative I. C. S. Handand autoritative 10.5. Inable to the biggest bargains in radio today. Over 100,000 homes rely on the 1. C. S. Radio Handbook to take the mystery out of radio. Why experiment in the dark when you can quickly learn the things that insure success? Hundreds of illustrations and diagrams explain everything so you can get the most out of whatever receiver you build or buy.

It contains: Electrical terms and circuits, antennas, batteries, generators and motors, electron (vacuum) tubes, many receiving hook-ups, radio and audio frequency amplification, broadcast and commercial transmitters and receivers, wave meters, super-regeneration, codes, license rules. Many other features.

A practical book. Written and edited by experienced engineers, in plain language. Something useful on every one of its 514 pages. The authority that covers every phase of radio, all under one cover in one book at a surprisingly small cost. Don't spend another cent for parts, turn a dial or touch a tool until you have mailed \$1.50 for this I. C. S. Radio Handbook.

Send \$1.50 at once and get this 514-page I.C.S. Radio Handbook—the biggest value in radio today. Money back if not satisfied.

-TEAR OUT HERE-International Correspondence Schools

Box 8282-E, Seranton, Penna.

I am enclosing \$1.50. Please send me—postaid—the 514-page I C. S. Radio Handbook.
Is understood that if I am not entirely satisfied
may return this book within five days and you
ill refund ny money.

The "LI	NCO	LN"
Enclosed Fixed	Chrysle, Carlotte	ALL METAL CONTO
Adjustable	NE SE	50LI0 GOLD CER 1001/20/20

Kills your Reflex Troubles

New \$1.50



Manufactured by

The LINCOLN MFG. CO. Dept. E. 1 LOS ANGELES, CAL

Insure your copy reaching you each month. Subscribe to RADIO NEWS—\$2.50 a year. Experimenter Publishing Co., 53 Park Pl., N.Y.C.

Suffix -ec- is equivalent to English -ness: Boneco, goodness; bonkoreco goodheartedness, kindness; bela, beautibonkoreco, ful; beleco, beautiousness, beauty.

Suffix -um- has no special meaning, similarly to "je" among the prepositions. Its different meanings are easily suggested by the context and the signification of the root to which it is joined. There are but a few words in which it is used, and these must be learned like simple words. The following few examples will indicate the manner of use of -um-, so that the student will recognize it readily: Malvarmo, cold; malvarmumi, to take cold; malvarmumo, a bad cold; kalkano, heel (of a foot); kalkanumo, heel (of a boot, shoe, etc.); kolo, neck; kolumo, colkomuna, common; komunumo, a commune, community; mano, hand; manumo, wristband, cuff; sapo, soap; sapumi, to soap; kolombo, dove; kolombumi, to

(To be continued)

The Strong Arm Circuit

(Continued from page 2053)

cause we've been listening in for the past three weeks, and have heard nothing at all traceable to any known form of radio com-munication. We have used all manner and makes of radio apparatus, of all types and designs, but not a thing have we been able to pick up. Yet they are in close contact at all times."

"But couldn't they be communicating

"But couldn't they be communicating through some other means than radio?" puts in Doris, sensible for once.

Jerry shakes his head. "Other means are out of the question, since this ship must remain at least twelve miles out, and matters of undetected landings are of a comparatively few moment's duration. It is, and has been, solely a case of hop, skip and and has been, solely a case of hop, skip and run; they come in, unload somewheres, and get out. We've never seen them unloading, although we once captured a small quantity of their liquor. But we have three times seen them either coming in or going out. They never seem to land twice in the same spot; the information they are receiving is spot; the information they are receiving is

spot; the information they are receiving is extremely authentic and quite apparently detailed, because they are timed to the minute."

There's silence a moment. Then J butts in. "Say, Jerry, what kind of a ship is it?"

"And there's another funny thing," muses The Master. "The ship is designed along the lines of an old-fashioned clipper, although anyone familiar with vessels can see that these lines have been appreciably altered to give the speed of a modern destroyer. There sails, all correctly arranged, but the one good look we've had proved that these sails were for ornament only. Steam or gasoline provides the motive power, of course, as evidenced by a small inconspicuous funnel amiddenced by a small inconspicuous tunnel amid-ship. Now, despite what might seem a handi-cap due to design and sails, this boat can attain a speed that is nothing short of mar-velous. Sufficient to say that no one has been able to catch her; even the revenue cutters are helpless."

"Odd," I admits.

"And what makes it worse, they flaunt their speed at us. It would seem that such a ship would desire to attract as little atten-tion as possible, yet this boat has six immense floodlights, inverted, and fastened to the masts in such a way as to create daylight for a radius of a hundred yards about the vessel. Added to that the crew stand around on deck and yell, sing, swear and throw taunts at us. Why, so fast is this ship that the boys have nicknamed her 'The Flying

Dutchman'."
"Unusual," I admits. "Eut where do you, and us, come in?

2.000 MILES

Clear Reception

In Broad Daylight

The efficiency and receiving distance of your Super-Heterodyne, or other loop-antenna set, can be increased from 35% to 100%, by using:

№ Super-Booster

This wonderful device enables you This wonderful device enables you to tune in stations you've never heard before, Signals that are only audible with head phones can be brought in on the loud speaker, with the Super-Booster.

Beautiful mahogany cabinet, 9"x1½"x5".
Placed on top of set. No batteries or tubes.
No connections to the set. Eliminates interference and increases the life of tubes and batteries. Rakes ANT set more selective.
Sent. C. O. D., we on receibt of money order.

DEALERS WRITE

YOUNG & ROVIG

2528 W. Seventh St., Les Angeles



No Back PanelFussing

Genuine Bakelite Throughout

(HEOSTATS ONE HOLE MOUNT

The one hole mount, one of the many exclusive features of the DeJur, makes it the easiest of all rheostats to mount, and when mounted it sets fixed and rigid. No acrews to get loose, no back panel fussing. Compare the DeJur. You will readily recognize its difference and superiority. Guaranteed absolutely.

Sold by all dealers.







The easy way to build your radio set.

REFLEX! COCKADAY! HARKNESS! ULTRADYNE! TROPADYNE! SUPER-HETERODYNE!

You can build these Receivers yourself with "Consrad" Patterns

The best method of receiving set construction. It is as easy to use these patterns as it is for a woman to use a dress Pattern.

Just select the books and patterns you want from the list attached to this page, then tear out the coupon and check the items you have selected.

Send the coupon to us with your name and address enclosing full remittance.

All patterns are 50c and books are 25c except where special prices are noted on the list.

All items will be shipped to you at once-postage paid.

SOLD BY ALL RADIO AND NEWSDEALERS

The Consrad Company, Inc.
233 Fulton Street New York, N. Y.

Consrad

RADIO'S FOREMOST PUBLISHERS

USE THIS BLANK TO ORDER

Just clip out this coupon, check the patterns or books you want and mail it to us with full remittance.

The Consrad Co., Inc., 233 Fulton St., New York, N. Y.

Gentlemen: I have checked below the patterns and books I desire. Enclosed find \$....., the full price. Kindly send me the items checked postpaid.

Consrad Patterns-50c each

- No. 2. How to Make a Two-Stage Amplifier.
- No. 4. How to Make a Reinartz Receiver.
- No. 5. How to Make a Reflex Receiver.
- No. 6. How to Make a Cockaday Receiver.
- No. 7. How to Make a Neutrodyne Receiver.
- No. 8. How to Make the Autoplex Receiver.
- No. 9. How to Make the S. T. 100 Receiver.
- No. 10. How to Make the Ultradyne Receiver.
-No. 11. How to Make a Five Tube Cockaday Re-
- No. 12. How to Make a Portable Receiver.
- No. 13. How to Make a Harkness Receiver.
-No. 14. How to Make The Original Genuine Super-Heterodyne. List \$1.00.
- No. 15. How to Make a Low Loss Receiver.
- No. 16. How to Make a Tropadyne Superadio.
-A. Radio Map of the U. S. on Cloth.
-B. 20 Radio Diagrams and Hook-ups. New Edition.
-C. All About Aerials and Their Construction.
-D. Radio Amateurs Practical Design Data.

Radio Books-25c each

- No. 1. Tips for the Radio Constructor.
- No. 2. How to Make Practical Radio Receivers.
- ... No. 3. Radio Questions Answered.
- No. 4. Radio Frequency Amplification.
- No. 5. Loud Talkers and How to Build Them.
- No. 6. How to Tune Your Radio Set.
-No. 7. One Hundred Radio Hook-ups. New Edition.
- No. 8. All About Radio Parts.
- No. 9. History and Operations of Vacuum Tubes.
- No. 10. The Neutrodyne and All About It.
- No. 11. How Radio is Received.
- No. 12. How to Locate Troubles in Your Radio Set.
- No. 13. Reflex Radio Receivers.
-No. 14: The Super-Heterodyne Theory and Construction.

Special Books

 ... Radio News Amateurs Handibook
 ... \$1.00

 ... Radio Log Book
 ... 50

 ... Wireless Course in 20 Lessons.—Leather Binding 2.00
 ... 2.00

 ... The Radio Instructor
 1.00

 ... The Radio Listeners Guide & Call Book
 ... 35

 ... The Radio Review
 ... 35

Name

Address

City State



-you of the through and through quality of Dilecto. It is the guarantee mark that insures you of the best panel from the standpoint of — strength! — beauty! finish! - service! - machinability! dielectric resistance! Such rigid requirements as have met complete specifications of the U.S. Navy and Signal Corps for more than 9 years.

Your radio dealer can provide any size panel with any drillings. Remember, insist upon-

(Distinguished by its red stripe)

The Continental Fibre Co. Factory: Newark, Del.

Service on Dilecto (also Conite, Contex and Vulcanized Fibre) from:

NEW YORK, 270 Madison Ave. CHICAGO, Wrigley Bldg. PITTSBURGH, Farmers Bank Bldg. LOS ANGELES, 307 S. Hill St. SAN FRANCISCO, 75 Fremont St. SEATTLE, 1041 Sixth Ave. So. (Offices and agents thruout the world)





"Here: Our only hope lies in apprehending the form of communication that is being employed. I, for one, feel certain that they have conceived some new method of radio, and it is with this end in mind I am working. I need assistance, and thought if your early mornings are available, you might like to help me, for the adventure if nothing

And I would, any excuse to get away from my foolishly contracted partner being welcome, but when you says "mornings" to an actor you're taking away his life blood and beauty sleep. I'm sorta undecided.

"Well, much as I'd like to help, if it's mornings-

Jerry smiles. "I should have said late evening. I mean the hours from midnight to three or four in the morning."

I'm all smiles. "That's a flivyer of another

I'm all smiles. "That's a my.
T says. "I'm with you."

"Well, you are not!" declares Doris. "Do you think I want a fairly good husband coming home looking like a honeycomb coil? When some of those dead-shot bootleggers be any more 'Hammerstein's Flips and Flops' this season."

Jerry hastens to assure her to the contrary. "Oh, I don't think there's any danger of that kind, Doris," he soothes. "At least, so far they've never evidenced any desire for mortal combat. It's never been possible. We can't get within hailing distance of them. And besides, we shall concentrate on the radio angle."

Doris is suspicious of anything that might connect me with a drink, but after a while

"Well, you may go, Joe," she says. "But if you ever come home drunk I'll sock you so hard on the ear you'll never get a pair of cans onto your dome again."

"Agreed," says I. "What's on the docket,

The Master is meditating. "By the way, Joe, it might not be a bad idea to have another man or two along."

"O. K. with me," I says. "Gonna get

"O. K. with me," I says. "Gonna get another revenue agent?"

Jerry shakes his head. "No," he says.

"I'd rather have someone as yet unknown in the underworld. Preferably someone with a good deal of physical strength."
"Easy," puts in Doris, "Why not take

Willie

"Nix," I says. "No brains."
"Jerry said 'physical' strength," reminds
my human copyright. "Willie's got plenty of that."

I'm forced to agree. "You're right," I admits. "And why not take Oscar, too, and have a little battalion of our own?"

So I explain it to The Master and he's "You're right,"

Then the job is to rope in Willie agreeable. and Oscar.

These two worthies never went through college, having graduated from somewheres along in the seventh grade in Norway, which may have an American equivalent, although I don't know it. They're not exactly dumb, but neither are they shining lights; just a coupla plain boys trying to get along. half an hour's arguing the boys has a fair idea of what we're after, barring a few deep technical facts which I couldn't explain and Jerry forgot. We're out after booze run-ners, that they know. Their part, as they take it, is to be a sorta combination witness,

guest and ballast. Everything's smooth.

We're playing New York for several weeks, so there ain't much trouble getting down to the docks after the show's over. Each night we gets into The Master's highpower launch and scoots out onto the high seas in response to the various clues, signs and so forth that have been recorded during the previous twenty-four hours. For the first week we don't get a nibble. By this the novelty's beginning to wear off; it's Saturday night, and we're coming home early, so's to be able to get up and out all

SPECIAL PRICES



Muzada Jacks have these features:

Heavy springs give firm grip on the plug. Plug Stop prevents any possibility of shorting. Narrow tongues reduce capacity effect to a minimum. Coin silver contact points will not burn out.

> Made in five styles. Look at these Prices.

If your dealer cannot supply you, we will fill your order direct. Here is an opportunity to stock up on high grade jacks at bargain prices.

Send for our Radio Catalog.

The Mazda Radio Mfg. Co. 3407 Perkins Avenue, Cleveland, Ohio





Says the Acme Apparatus Co.

No longer does the whisker scratch the crystal, or is the sensitiveness killed by heavy spring pressure—the Vernier Regulator takes care of that. It will surprise you to know how sensitive Crystal Detectors are when correctly made.

BROWNLIE VERNIER DETECTOR VERNIER

For Panel or Base Mounting \$2.00

At your dealers otherwise send purchase price and you will be supplied postpaid.

ROLAND BROWNLIE & COMPANY Medford, Mass.



Insure your copy reaching you each month. Subscribe to RADIO NEWS — \$2.50 a year. Experimenter Publishing Co., 53 Park Pl., N.Y.C.

TROPADYNE SUPERADIO OUTFIT

T HIS Superadio 6 Tube Set brings in Station KFKX (Hastings, Nebraska), 1200 miles, in New York City, clearly on a loud speaker, using only the small loop which comes with the outfit.

The outfit advertised here is complete, The outfit advertised here is complete, as listed below, everything needed is included, down to the last screw. The charts, blueprints, directions and photos furnished are so complete and explicit that anyone can build this set and have it working within a few hours. There is nothing additional to buy except the necessary batteries and tubes. Price includes mahoganite cabinet and folding cludes mahoganite cabinet and folding loop aerial.

You can pay \$150 or more for an outfit, or \$200 or more for a set, but you cannot possibly buy a better set than this

READ THIS

Utmost sharpness-Cuts thru locals bringing in long distant stations as if they were locals.

Ease of Tuning-Only two dials.

Tuned Intermediate Transformers; the only real BALANCED set of its kind made. Once transformers are tuned they need not be touched again.

Your Money Refunded if this set does not satisfy you in all respects—if after 5 days' fair trial you do not proclaim the TROPADYNE the best radio set you ever listened to.



"A GREAT ADVANCE IN RADIO SET BUILDING"

By using our new NO-SOD-ER connectors, any one, by means of a screw driver and a pair of pliers, can put this set together. No bus bar, no heat, no flame, no soldering iron (only an expert can solder right), no fluss, no trouble. By means of our insulated, double eyeletted, flexible connectors, perfect connections are made, not only mechanically, but electrically as well. Short circuits impossible. Read all about this new advance on page 2038, May issue of RADIO NEWS.

REAR VIEW OF TROPADYNE



Set uses 201A or UV-199 Tubes.

Note These Important Features:

DISTANCE, VOLUME AND TONE QUALITY equal to any

tube set sold anywhere at any price.

LOOP RECEPTION—Outside aerial not required with this set

the complete loop is included in outfit.

PERMANENT LOGGING OF STATIONS—Follow chart furnished; there are only two tuning controls and you will always find the same station at the same spots on the dials. Our log chart shows you at what point to find any station.

MICROMETER VERNIER DIALS giving you the full advan-

tage of the exceptionally sharp tuning.
OUTFIT IS ABSOLUTELY COMPLETE—Drilled panel, Mahoganite Cabinet and everything else needed, except tubes and

ECONOMY and SIMPLICITY-This is not a reflex, yet six tubes do the work for which other sets require eight to ten.

The Editor of Radio News

In the August 1924 issue, said this about the Tresadyne: "Here is a remarkable receiver which we warmly recommend to our readers. It has several new and unusual features. In the first place only 6 tubes are used giving as much volume as the average 8 tube Heterodyne. The selectivity of this set is musual. Unequalities of the intermediate transformers have now been done away with by tuning each transformer. After the transformer has been tuned, it can be left this way, no further tuning being necessary. "This system makes for maximum sharpness and maximum volume. Another outstanding point of superiority of the Tropadyne circuit is that it practically does not radiate, thereby not interfering with other nearby receiving stations. A saving of two tubes as well as an increase, of selectivity is obtained with this new circuit."

Complete List of Parts:

4 RICO Tropaformers; 1 Standard Variocoupler; 2 Certified Low Loss 23-plate Condensers; 1 Calibrated Transformer; 2 Jacks; 3 Fixed Condensers; 6 Bakelite Sockets; 2 Vernier Dials; 1 Rheostat; 1 Potentiometer; 1 7x24 Panel; 1 7x24 Mahoganite Cabinet and Baseboard; Supply of "No-Sod-er" Connectors; 1 Folding Loop Aerial; 1 Grid Loak and Mounting; Binding Posts; Flexible Wire; 1 Bakelite Binding Post Strip; 4 doz. Screws; Full Directions.

We ship in 24 hours

RADIO SPECIALTY COMPANY.

New "Rasco" Catalog NO.

CONTAINS 75 VACUUM TUBE HOOK.UPS.
300 ILLUSTRATIONS. 500 ARTICLES.
All Armstrong Circuits are explained clearly.
all values having been given, leaving out nothing to pussle you.
The explained clearly in the explained clearly in the explained clearly.
The V.T. as a detector and one-step amplifier; one-step radio frequency amplifier and detector; three stage audio frequency amplifier; and the explained in the explained amplifier; and consider a complete and detector in the explained in the explained amplifier; and the explained amplifier; and the explained amplifier; all Reflex Circuits.

A POSTAL CARD CARD **BRINGS IT** SEE OUR AD ON PAGES 038 and 2039 NEWS

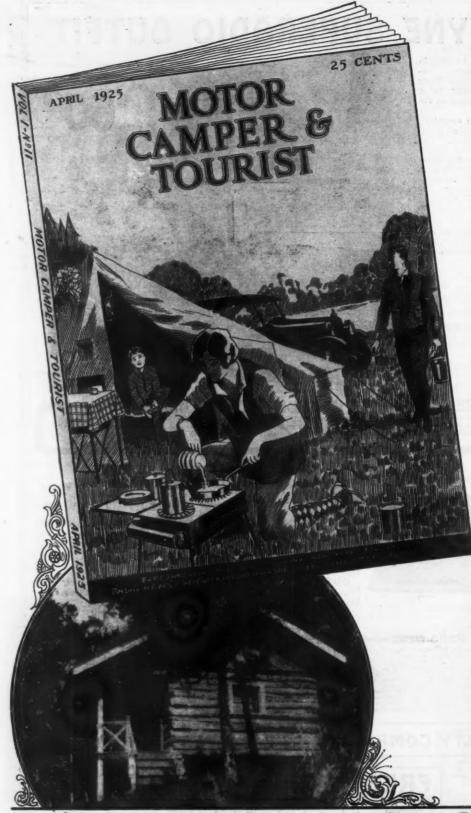
SEND NO MONEY RADIO SPECIALTY CO., 98 Park Place, New York, N. Y.

Please send at once one complete Tropadyne Superadio Outfit as advertised in May "Radio News." I will pay postman or expressman \$60.50 upon arrival.

98 PARK PLACE, NEW YORK

NAME

STREET or R.F.D.



Twenty-Five of the most interesting, entertaining and instructive articles in the April Issue:

The Highways and the By-Ways By R. K. Helphenstine

By R. K. Helphenstine
The Troubles of Mrs.
Chassis Automobile

By Lee Tibbals
The Signs of the Times, By
Adelaide Allen Andrews

Camp New York
A Woman's Advice on

Motor-Camping
By Mrs. Jean Cunningham
Some Attractive Mid-West

Motor-Camps
Selling the Canadian Winter By E. L. Chicanot
Thirty - Eight H undred
Miles in a Camping Car
By Isabel Diehl

By Isabel Diehl
Springtime Has Motor
Modes in Shawls and Hats
By Mrs. A. Sherman
Hitchcock

The Ozarks

By Dr. J. J. Gaines

Waysiding in Your Own

Country

By A. H. Van Voris

Are You Heading for the Old Southwest? By Ralph Pierson

Gasoline Stoves
By Willis O. C. Ellis

Diamond Cave
Our National Forest
By Harry Dicson

How Are the Roads?

By Maurice Decker

Old Spanish Trail
By Ford Foster

The Open Road Map of Arkansas Ignition Hints

By Harold Jackson Guiding Stars for April

Guiding Stars for April Campers

By Isabel Lewis

Campsite Management
New Accessories and
Equipment

Equipment
Roadside Repairs & Handy
Kinks

You Auto Laugh

MOTOR CAMPER & TOURIST IS SOLD ON ALL NEWSSTANDS 25c THE COPY

Germott Publishing Co., Inc.

Owners

Licensed Publishers
THE EXPERIMENTER
PUBLISHING CO, INC.
53 Park Place, New York

A Log Cabin in the Ozarks

Read the story of a trip through the famous "Ozarks" in the April issue

day Sunday. The Master, as usual, is busy; Willie and Oscar used to be fishermen, and are suffering a relapse; me, I'm a bit bored.

Jerry and me are in the cabin, the boys being on the front deck. I gets a case of tongue itch, and starts to broadcast.

"Gimme action, boy," I demands. "I'm all

primed for a-

"Hey!" comes Willie's voice. "Look!" "Hey!" comes Willie's voice. "Look!"
We're just passing a small cove, and therefrom charges the Flying Dutchman, right at' us. It looks like we're going to be hit, but our stern clears the bow of the clipper and we takes a nice heavy roll on the wave. True to form, the crew are leaning over the edges, talking and yelling. The floodlights are blinding. And there's a low, steady hum coming from the vessel.

"Hey, you!" yells somebody. "Get that hulk outa the way!"
"Get outs the way vourself." I yells back

"Get outa the way yourself," I yells back. In the excitement Jerry has been taking as keen a view of the ship as the roll of the launch will permit. Pursuit is obviously out of the question; I've seen some fast things, but this baby gets the fur-lined vacuum tube. Speed? Oi!

Just as the stern of the ship passes us, Willie, who's managed to get around to the rear, stands up and shakes his fist at the vessel. Then a big red-headed sailor on the stern yells out this sterling affront. "Aw, go to Hell, you dirty Swede!"

Now, Willie is a Norwegian, and Norwegians and Swedes have for each other the friendly disdain of a Rabbi for salt pork.

The minute the red-head calls Willie a dirty Swede I expects trouble. I'm right. The Midnight Sons arise to the occasion.

Shaking his fist and swearing in his native tongue Willie, aided and abeted by Oscar, tells the vanishing clipper—well, it wouldn't be fit to publish. Then the two lutefisk lads

comes into the cabin. "That damn red-head call me dirty Swede!" yelps Willie. "If I catch him I bade wring his yellar neck!"

"Ay!" agrees Oscar.

Even The Master smiles, although the occasion doesn't warrant much. Then he seizes the receivers and clamps 'em on, listening in feverishly. He tunes fractically for a few moments; then a faint gleam of hope

comes to his eyes.

"I'm getting something," he says. "It sounds like a continuous hum, broken by high and low notes. Some code—there's a

high—two highs—a low—"
The Master keeps on muttering to himself while he's writing down the message. After two or three minutes the hum is gone, and the sheet before Jerry is filled with highs, lows and mediums. He immediately begins to translate; Willie and Oscar converses in their own code while I takes charge as captain, engineer and boatswain. It's a great life on the cream ways to the control of the life on the ocean wave.

As we're nearing port Jerry comes outa

As we...
the cabin.
"Any luck?" I inquires.
The Master shakes his head. "Funny,"
he says, "I can't make head nor tail of it.

A 1'11 have to leave it to the experts

at headquarters."
I nods. "Will we be going out tomor-

at headquarters."

I nods, "Will we be going out tomorrow?" I asks.

"I should say so!" exclaims Jerry. "At last we're onto something at least partly definite. Tell the boys we'll need them, if they'll come."

Will they come? Shades of King Knute!

"I bane find that fellar who call me Swede," growls Willie. "I bane knock his block off."

"Ay!" agrees Oscar.

"Ay!" agrees Oscar.
Well, the next morning we're out by ten o'clock, onto the high seas by twelve, and the afternoon is spent up and down the near coast, but with no results. Of course, the Flying Dutchman ain't expected until after dark, but Jerry hopes to pick up some more



"I selected it for its high insulating qualities

It cuts down the losses in the circuit"

> THOSE were the exact words of a prize-winner in a radio set-building prize contest, when asked why he used a Radion Panel. Like thousands of others, he had found by experience that there is nothing quite like Radion for real results.

> Our engineers developed Radion Panels especially to order for radio. Authoritative laboratory tests prove that it has highest insulating characteristics. Losses from surface leakage and dielectric absorption are exceptionally low. And low losses mean clearer reception, more volume and more distance.

Send for booklet, "Building Your Own Set"

Our new booklet, "Building Your Own Set," giving wiring Set," giving wiring diagrams, front and rear views, showing new set with slanting panel, sets with the new Radion built-in horn, lists of parts and directions for building the most popular circuits— mailed for ten cents. Easy to work-moisture proofresists warping

RADION is easy to cut, drill and saw. No special tools are needed-just use ordinary tools found around any home. You need not have the slightest fear of chipping. Radion resists warping. It's strong. It's moisture proof. It comes in eighteen stock sizes and two kinds, black and mahoganite.

Radio dealers have the exact size you want. The use of Radion by the manufacturers of ready-built sets is almost invariably a sign of general good quality in that set.

AMERICAN HARD RUBBER COMPANY Dept. A5, 11 Mercer St.,

Chicago Office: Conway Building.

Pacific Coast Agent: Goodyear Rubber Company, San Francisco, Portland.

The Supreme Insulation

Dials, Sockets, Binding Posts, Panels, etc.

AMERICAN HARD RUBBER CO., Dept. A5, 11 Mercer St., New York City.

Please send me your new booklet, "Building Your Own Set," for which I enclose 10 cents (stamps or coin).

Address ...

State



Don't Take Chances! LOCK vour set!



Plus!

1. Easily installed —One hole mount-

2. Compact — Requires less room behind panel than any other switch.

3. Noiseless -Post-tive wiping contact; can't wear out. 4. Sheekproof—Shell mounting and key-handle insulated. HERE'S a remarkable bat-tery switch! Not only does it give sturdy, silent and efficient filament control—it locks

efficient filament control—it locks your set, too!
There's no chance for anyone meddling with your set—ranning down your batteries or barning out your tabes—when the key to the Walbert LOCK-SWITCH is in your pocket. Your set is locked and off!

Play safe! Put a Walbert LOCK-SWITCH (the original locking battery switch) on your set tonite. It costs no more than a plain battery switch! At your dealer or sent postpaid on receipt of purchase price.

Walbert LOCK-SWITCH 50c Silver plated Gold plated65c Extra key with key ring attachment

JOBBERS AND DEALERS: Write for Discounts

WALBERT MANUFACTURING CO. 923 Wrightwood Ave., Chicago, U. S. A.



Insure your copy reaching you each month. Subscribe to RADIO NEWS — \$2.50 a year. Experimenter Publishing Co., 53 Park Pl., N.Y.C.

code. I'm pilot, ad infinitum, while The Master figures in roots and logarithms and sines. Oscar finally decides to cook, so about five Shortly thereafter Jerry has dinner. draws me to one side.

"I've a thin idea running through my head," he says. "I can't explain it now, but if things happen as they did last night—if we meet the Flying Dutchman—will you, if I'm not here, throw in this switch when the ship comes nearest? I shall be busy on the front deck from now on.

"Sure," I says. So we cruises around while The Master rigs up a peculiar looking aerial on the bow of the launch. Knowing Jerry rather well, I asks no questions, and Willie and Oscar can't, so things is quiet.

can't, so things is quiet.

By nine o'clock it's dark, and all eyes are peeled. Neither The Master nor myself thought we'd be lucky two nights in a row, but we are. Rounding a point, we sees The Flying Dutchman, just putting out of a

cove.
"Kill the motor, quick!" calls Jerry hoarsely.

I shuts off the power and we glides around the point. The other ship, in order to pass us, must come within a hundred yards from where we're trying to hide.

They sees us right away, and starts to come out, lights flaring and crew yelling like mad. Then The Master yells for me to throw in the switch.

I does, and to my utter surprise The Fly-ing Dutchman slows down and stops, right in front of us. Then funny things begins to happen.

As we brushes alongside the ship Willie makes a grab for a ladder. I've my gat ready, expecting somebody to start fireworks, but no! The crew just stands where they are and calls us names! I'm onto them. It's too easy-there's something wrong. Here we are coming up the side of the vessel and all they does is swear at us!

"It's a trap!" I yells to Willie. "Come

But Willie is seeing red. He climbs over

the rail and makes a bee line for the stern. The big red-headed gink is still there, swearing all colors and styles. But none of them moves an inch!

"Willie!" I yelps, terrified. "Come back!
It's a frameup!"

But centuries of Norse blood are out to ek vengeance. Willie is strong, extremely seek vengeance. Willie is strong, extremely so. Although he ain't had no training as either a boxer or a fighter, if you happens to be foolish enough to let him land on you, well, wooden overcoats is in order. This red-head is game, all right. He don't quiver an eyelash. Willie's fist comes into swift, sincere and violent contact with the sailor's iaw when-"Owww!!"

"What is it?" calls The Master, unduly

"Owww!" yelps Willie. "My fist!" Well, it's a case of but-you-oughta-seethe-other-fellow. Willie's hand is cut up, but the red-head's whole face is shattered. And he stands there, still swearing!

"What the-Jerry laughs, triumphant. "I came to this conclusion last night," he says. "They're wax dummies!

I let's that sink in a coupla megohms. "D-Dummies?"

Jerry laughs again. "When I found that I couldn't translate that message, I suddenly decided that it wasn't meant to be a message. And it wasn't! That continuous wave was a stream of power, fed by apparatus on the shore!"

Willie's nursing his hand, but he gets that much. "What?" he asks.
"The high notes and low notes must have

meant turn right and left-but wait-let's find out for certain."

We takes a run into the cabin. Jerry's





Rochester, N. Y.

115-117 Caledonia Ave.,

The Famous Truly Portable TELMACO P-1 Receiver

Four Tubes Do the Work of 7 Coast-to-coast reception. Aerial, loud speaker, and batteries self-contained. Carry from room to room-take it any where. Size 8'x19'x18'. Total weight only 22 lbs. Complete with tubes and batteries. \$125,00 \$145.50. Receiver only

P-1 Kit Saves You Money!

In response to a popular demand we now offer the Telmaco P-1 Receiver in kit form. This contains all parts, as built by us, including case, drilled and engraved panel, and illustrated instructions. \$80.00 Complete kit.

Ask your dealer or write us. Descriptive folder free. Radio Division :

Telephone Maintenance Co. 20 So. Wells St. Dept. B, Chicago, Ill. - DANGE

Quality Radio Exclusively & Established 1918





THE ANDREWS PADDLEWHEEL COIL

fix

th

te

ex

ha

cle

A low-loss inductance. Improves tone quality and increases sig-nal strength and selectivity. Price, with bracket \$3.00 RADIO UNITS, INC. 1300 First Ave., Maywood, III.

Insure your copy reaching you each month. Subscribe to RADIO NEWS — \$2.50 a year. Experimenter Publishing Co., 53 Park Pl., N.Y.C.

right. I can see that without glasses. The full of radio equipment.

Willie and Oscar are posted as guards while The Master and me goes over the cabin. Jerry's amazed, and I am, too, after he's explained what's what.

it's nothing short of marvelous!" ims. "There wasn't a human being "Joe, he exclaims. aboard this ship!"

"All radio controlled?" I asks.

how?

"So far as I can determine, the ship was regulated entirely through this heavy power wave, although just how I can't say until I have investigated further."

We goes into the hold, filled with ten-tube whiskey—the kind that needs no amplifi-cation—and there's more apparatus. The Master finds it's a special multiplex transmitting and receiving outfit, used for re-ceiving the profanity and relaying it to the sailor-dummies through a clever system of automatic contacts. Jerry's still puzzled.

"But this doesn't clear it up," he says.

"But this doesn't clear it up," he says. "In the first place, how could the persons who were doing the talking know what to say, and in the second place how could this station receive the voices without anyone else getting it? We tried every known means to no avail, and yet this outfit seems to be wired in quite the ordinary way."

"And also," I puts in, "how in the devil could they steer this ship? Oh, I know the thing's possible, technically, as long as the ship is in sight of the operator. But

the ship is in sight of the operator. But when the vessel gets out a coupla dozen miles, how do they do it?" But

Jerry smiles at my display of gray mat-ter. "I'd been wondering about that, too. Offhand, I can't say until I've traced the wiring of the apparatus upstairs. It'll take some time. But it's certain that whoever some time. But it's certain that whoever did guide this ship, isn't on it and he most certainly could not see over a few miles in daylight, let alone at night."

After half an hour The Master decides he can't do much more until daylight, and assistance arrives, so we shoves off into our own launch while Jerry dit-dats into headquarters for a cutter to come and guard the clipper.

"You might turn off the switch I men-tioned," says The Master. "It merely coun-teracted the wave as sent from the shore."

I pulls the switch and BANG!

The shock of the explosion almost capsizes the launch. When we gets to our feet, the air is raining bits of wood, steel and glass, and there's a beautiful hooch fog and spray all over us. The Flying Dutchman is no

It's a minute or so before we can get our breaths. Willie is the first to speak.
"Well, she's gone!" he remarks.
I turns to Jerry. "What the deuce caused

The Master's almost white. "Good Lord, be," he gasps. "We came within an ace

The Master's almost white. Good Lord, Joe," he gasps. "We came within an ace of being blown to atoms!"

"Oh, we were safe," I says. "We were a good two hundred yards off."

Jerry shakes his head vigorously. "Oh, not now. Don't you see? The bootleggers'd fixed a bomb to blow up the ship in case it was captured. All they had to do was stop the nower wave and the vessel would be shatthe power wave and the vessel would be shattered. My counteracting wave held off the explosion."

We lets that rest for a little while. Then

I speaks. "Well, we found them, anyways."

The Master nods. "We've destroyed this ship, but we haven't found out how it was handled. There's nothing to prevent their building another. The thing was extremely clever—exceptionally so; but I can't figure how they guided it or controlled the speak-

If there's one thing that gets on Jerry's nerves, it's to be unable to analyze some





The Simplest Practical Radio Set Made

A Complete Radio Receiver including Radiogem, Phone and Aerial

The Complete Outfit Consists of Three Parts

The RADIOGEM

The simplest radio outfit made—yet as practical as the most expensive. A crystal receiving set that you can operate and enjoy even though you know absolutely nothing about radio. You receive the RADIOGEM unassembled, together with a clearly written instruction book, which shows you how to quickly and easily construct the set, using only your hands and a scissors. The outfit comprises all the necessary wire, contact points, detector mineral, tube on which to wind the coil, etc., etc. The instruction book explains simply and completely the principles of radio and its graphic illustrations make the assembling of the RADIOGEM real fun.

(Two) The GEMPHONE

An adjustable, 1,000-ohm phone complete with 3-ft. cord—the first inexpensive adjustable receiver made. The Gemphone is of standard type and made of the very best grade of materials throughout. The case is made of turned wood, an exclusive feature with the "GEMPHONE." This is responsible for its exceptionally rich, and mellow tone. Like RADIOGEM, the GEMPHONE is sold unassembled. Our Instruction pamphlet shows how to assemble it in two minutes, using only a screw driver.

(Three) The AERIAL OUTFIT

Consisting of 100 ft. of standard cop-per aerial wire and two porcelain insula-

Complete Radiogem

Outfits - \$2.50

The Radiogem, only - 1.00

The Gemphone, only - 1.00

Aerial Outfit, only -

RAGEMCO

Radio Headquarters for the Finest and BEST Radio Tools



RADIO TOOLSET

This is the handlest set of tools ever made for Radlo Work by the makers of the famous "YANKEE" Tools. It contains the following: 1 Rachet Serangeliver 64.

fantous "TANKE".

Tools, It contains the following: Ruchets following: Ruchets following: Ruchets following: Ruchet foll



HAND DRILL

to store deills.

Iron frame, nickeled parts, ball
and centering accupound shank drills from 0 to 3-16. Length of
Inches.



WIREBENDING TOOL

For making eyes, loops, bends, and offsets on Bus Bar wire. With this device any Radio Constructor can orably with any factory made set. Easier to use and more accurate than pilers. Full directions in box. Made of PRICE—No. 203

CIRCLE CUTTER



Especially designed for the Radio Constructor. Made of the finest material and equipment of the finest material and equipment of the finest material and equipment of the finest field of the field



specially designed for Radio Work by the makers of the amous "Yankee" Tools, A beautiful balanced, small, owerful drill with 4 to 1 ratio of gears for speed. Spe-lai chuck 9-32" capacity, to take largest drill, mostly urnished with drill or tool sets. Length over all, 95 tin.



Three-in-One Nut Wrench. Consists of handle with hollow stem 6 inches in length and three interchangeable sockets fitting popular sizes of nuts. The hexagon sockets sockets fitting popular sizes of nuts. The hexagon sockets fitting popular sizes of nuts. The hexagon sockets fitting popular sizes of nuts. The hexagon sockets fitting popular sizes of nuts.





RADIO HANDI HANDI-TOOL

Bends Bus Bar or wire strips and scrapes wire, bores and reams holes, etc. Tool consists of 4 in.

black japanned handle, to which is attack device, with nickeled ferrule and 3 in.



TOOL CHEST

Set consists of "LOCK-GRIP" mater handle. "
GRIP" mater handle. "





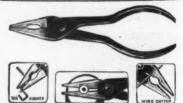
RADIO DRILL SET

composed of 10 straight shank twist drills, fitting all hand and breast drills. The selection of these drills has been especially made for Radio Constructors and consists of the following sizes: 1-16, 5-64, 3-32, 7-41, %, 9-61. Following sizes: 1



ELECTRIC SOLDERING IRON

perfect tool for Radio Work. Operates either on 110-nit A.C. or D.C. The heat element is of Nichrouse, hich precents overheating and assures the desirted even emperature. Size of Iron, 10½ in, long. A 4-t. could plug is formished. temperature. Size and plug is furnis PRICE—No. 800\$2.00



Combination Plier, Drop forged, slend PRICE-No. 202



Long Sharp Nose, Side Cutting Pliers. Just the pliers for the radio constructor. Bends and cuts all kinds of soft wire. Nose 1½ inches long, black body, polished jaws. Length 5½ inches.

75c
75c
75c

Order all tools by order number. All goods are shipped free of transportation charges to all parts of the United States and possessions the same day as the order is received.

MONEY REFUND GUARANTEE

If you are not satisfied money will be refunded on return of goods.

The RADIOGEM CORP., 66-R W. Broadway, New York

scientific fact. All the rest of the way into port he's cranky as a flivver and it takes all my persuading powers and Willie's strong arms to pilot him into a small sailor's café for a bite to eat. The Master is plain, good, for a bite to eat. The Master is plain, good, old-fashioned, peevish; he gulps his coffee just as if he'd never known which spoon to use on the eighth course. Me, I'm amused. "Say, Jerry," I asks, "have you solved it yet?"

"Aw, shut up!" growls The Master. Really, it's such a novelty to see his serenity ruffled that I sorta teases him along. We're in one of a string of small booths. We're

in one of a string of small booths, a kind of breakfast nook effect, with curtains and low partitions, with Jerry and me on one side and the Herring brothers across from

There's another party of sailors in the booth back of us, talking low and angrily, and between them and The Master I'm enjoying myself to the hilt. Honest, it's a pleasure to be in such congenial company after a season in close contact with your

Suddenly Willie utters a big, explosive oath and hops onto the table, making a nose dive over the partition into the next booth. Oscar follows. So does pandemonium.

I ain't seen such a swift and sure milling since coherers was an essential. Willie and Oscar, although they ain't boxers—well, within two minutes there's four guys laying on the floor, knocked cold. Willie's steam-

on the floor, knocked cold. Willie's steaming over one of them.

"That's him!" he yelps. "He bane call me dirty Swede! I know his voice!"

"Why, you're mistaken," says The Master. "Now we're in for it—"

He shuts up like a clam and bends over the chief victim. Closely he scrutinizes the gentleman's map and then consults a photo-graph. A smile slowly comes to Jerry's face, topped by a shout of pure joy.

"Solved!" he yells. "Solved!"
"Explain," I demands, feeling a bit unnecessary in front of the growing crowd.
"Whadda ya mean, solved?"

Jerry hands me the photo. Sure enough, it's labeled Martin Pemberton, alias Marty the Soak, wanted for violation of about everything on the list, most recently of bigtime bootlegging.

"Nice," I comments. "Where does this

help us so much?"
"Look at his clothes!" cries Jerry. "Look at his clothes!"

I does. Then the dawn comes up like thunder.

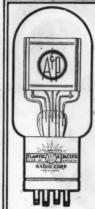
"Well, I'll be—" I gasps. "An aviator!"
"Everything's explained!!" gurgles The Master. "But how-"

Jerry waxes enthusiastic. "You see, by use of a heavily muffled plane they could use of a neavily mumed plane they could drop down to a comparatively short distance from the ship. Without lights on the plane, supplemented by the inverted floods on the ship, together with the racket the sailors made, no one would be able to detect their presence. That accounts for the low hum we heard just as we passed the vessel. It

we heard just as we passed the vessel. It was the exhaust of the 'plane."

"But the voices—how was it we couldn't hear them on our radio?"

Jerry laughs. "Well, we could have—at one time. You see, by what must have been marvelously delicate instruments, coupled with a closely directed aerial, they were able to confine the waves of speech to an area perhaps not exceeding a hundred yards about the ship. They logically deduced that anyone coming within this radius would be so flustered as to forget to listen in. They were right. We forgot to. By use of telescopes they were able to see what was going scopes they were able to see what was going on and supplied words to fit the setting." "That accounts for Willie being called



The Famous Old Reliable ATLANTIC &
PACIFIC RADIO & AUDIO FREQUENCY

TUBE

USED AS DETECTOR OR **AMPLIFIER** Scientifically Constructed NOISELESS-TIPLESS-LONG LIFE-

Ask any user, he will tell of its merits. The greatest tube known for DX reception. Enormous vol-ume without distortion. Low battery consumption-uses 1/4 ampere,

Price \$3.00

Mail Orders Given Prompt Attention ALL TUBES FULLY GUARANTEED

FREE Our Research Department desires statistics regarding results obtained by long and constant users of A. & P. Tubes. For complete and satisfactory information and statements from bonafide users of our tubes for four years or longer we will furnish Free of Charge 5 NEW TYPE A. & P. TUBES.

ATLANTIC & PACIFIC RADIO CORPORATION

West 34th Street, New York City THE PIONEER OF RADIO



You Can Improve any Reflex or Crystal Set with the

CARBORUNDUM DETECTOR UNIT

CHARPER tuning—clear, true reception—increased selectivity—greater distance—perfect rectification. No need to search around for a sensitive spot—no adjustments.

The Carborundum Detector is fixed, permanent, laboratorytested. It can't burn out. It can't get out of order. Carborundum specially made and tested for radio purposes exclusively makes possible the success of this remarkable detector unit. Carborundum Detectors

The Carborundum Company, Niagara Falls, N.Y.

New York, Chicago, Boston, Philadelphia, Cleveland, Detroit, Cincinnati Pittsburgh, Milwaukee, Grand Rapids

The

Niagara Falls, N.Y.

Remittance enclosed.

A

th

63

pe

R

of

th W

of

of

ar fr

a th

m

ed

th

pl

W

el Ti

pa

br

H

th

jo

th

ar

th

th

te

fu

ce

pe

au

m

m

en

an

tri

fo ga

as

sa

of

W

Sta



for the closest possible tuning. Accuratunes are actual micrometer tuning controls, geared 80-1 ratio for hair splitting adjustment. Give greatratio for hair splitting adjustment. Give greater efficiency than any vernier condenser, vernier attachments or any other tuning device. Indispensable on all Super-Heterodynes. Fit all standard condenser shafts. Flush panel mounting—no cutting of condenser shafts. Price \$3.50. At your dealer's—otherwise send purchase price and you will be supplied postpaid.

Write for descriptive circular MYDAR RADIO COMPANY
9-F Campbell St., Newark, N. J.
Radio Ltd., Mentroal, Canadian Representatives.
G. E. Marbaix, 27 Anning St., Lendon, E.C.2, English Rep.

CCURATUNE



The MOZART GRAND CO.

Manufacturing fine

Radio Reproducing Apparatus

at 235-49 Elizabeth Avenue, NEWARK, N. J., U. S. A.

argest exclusive Radio Jobbers in middle West. Write for discounts 123 W. Madison St. Chicago a Swede," I grins. "You see, Willie, from five hundred feet up it ain't no easy matter

to pick nationalities "Ay," admits Wi admits Willie.

We all have a good chuckle. "Well, it's solved," I says.
"Solved by Willie," adds The Master, offering his hand to that individual. "Any

reward coming from this goes to you."

It takes a few moments for Willie to get things straight, but then he's all smiles. "I say I solved him!" he declares. "I bane knock his dirty block long wave af."

The police comes in and drags out the prisoners, while Jerry sets 'em up to the house. All is merry.
"Say, Willie," I asks, "whatcha gonna do with that reward?"
"Well," he replies, scratching his head, "I

bane think I buy me a radio and get more rewards.'

I laughs. "Nix, Willie," I says. "Stick to your pole."

All of which goes to prove that might is

ight if you have might in your right-or left. Get me?

Radio and the Copyright Problem

(Continued from page 2046)

has expired, but audiences demand up-todate music as well as the popular songs of the past. So it is practically necessary for artists performing at broadcast stations to resort to newly copyrighted music. But here comes the difficulty. If I buy printed sheet music, the possession of the tangible propcrty does not vest in me ownership or con-trol of the thought and creation of the author for any other than my own and others private enjoyment. May I legally sing that selection, which I have learned from the sheet, into the radio apparatus for the enjoyment of an unknown and unseen audience

The opinions of the Federal Courts are conflicting. In 1923 it was held that broadcasting from a department store was a performance for profit. L. Bamberger & Co. conduct a department store in Newark, N. J. It also has instituted a radio depart-ment, selling radio equipment of all sorts. This company also conducts a broadcast sta-tion (WOR) from which vocal and instru-mental concerts and other entertainment and information are broadcast. The station per-formed "Mother Machree" and the owner of the copyright claimed the copyright was infringed upon, and sued for relief. The District Court granted the injunction. Judge Lynch held that this was a public performance for profit for the following reasons:

1. The defendant charged the cost of the

broadcast station against the general expenses of the business. 2. While the Bamberger Company does not broadcast the sale price of its wares, it does broadcast a slogan, "L. Bamberger & Co., one of America's greatest stores, Newark, N. J.," at the beginning and end of each program. 3. If the purpose had been eleemosynary, for charitable purposes, and not for profit, it is likely that it would have adopted some anonymous name or initial.

PUBLIC PERFORMANCE?

Other Federal Courts have held that the act of broadcasting is not a public performance. In the fall of 1923 the American Automobile Accessories Company, of Cincinnati, a manufacturer of radio receiving sets and parts, caused the rendition of "Dreamy Melody" by means of singing and by means of singing and an orchestra to be broadcast from its station The owner of the copyright, in that city. arguing that this was a public performance for profit under the Act of 1909, petitioned

Prices Smashed! Quality Not Sacrificed GONSU

Quality Not Sacrificed
Here is real battery
quality, guaranteed to you, at
prices that will astound the entire battery-buying public. Order
direct free factory. Fut the Dealer's
Profit in your own pocket. You actually save
much more than half, and so that you can
convinced of true quality and performance, we
evice a wife.

Profit in your on than half, much more than half, much more than half, convinced of true quality and private written Two-Year Guarantee.

Hereisyour protection! Noneed to take a chance Our battery is right—and the price is the lowes ever made. Convince yourself. Read the price ever made. Convince yourself. Read the price ever made. Convince yourself. Read the price ever made. The price state of the price evermade. Convince yourself. Read the price Special 2-Velt Radio Storage Battery, \$2.78 Special 4-Velt Radio Storage Battery, 6.00 6-Volt, \$0 Amp. Radio Storage Battery, 6.00 6-Volt, \$0 Amp. Radio Storage Battery, 8.00 6-Volt, \$0.0 Amp. Radio Storage Battery, 8.00 6-Volt, \$1.00 Amp. Radio Storage Battery, 9.30 6-Volt, \$20 Amp. Radio Storage Battery, 9.30 6-Volt, \$20 Amp. Radio Storage Battery, 13.00

We ask for no deposit. Simply send name and address and style wanted. Battery will be shipped the day we receive your order Express C. O. D., subject to your examination on arrival. Our guarantee accompanies each battery. We allow 5% discount for cash in full with order. You cannot losel Act quick. Send your order today—NOW.

Arrow Battery Co. 1215 South Wabash Ave. Chicago, Ill. Dept. 6



What is prostate gland disorder?
Why does it come to 65% of all men past a certain middle age? Are you a victing? Why does it cause sciation, aching feet, back and legs, frequent nightly risings? Amazing hook written by the comparison of the comp

FAHNESTOCK CLIPS The Perfect Radio Connectors - Are Used



By manufacturers standard sets and parts and makers of wet Battery and exclusive on Eveready Dry Batteries. Their Sure Patented Grip is recognized uni-versally by enthusiastic

ARROW

Reg. U.S. Patent Office users. FAHNESTOCK ELECTRIC COMPANY
Long Island City

Send for TUSKA Catalog

Investigate unique Tuska Receivers before you decide which set to buy or build. Write for latest Tuska catalog giving hints on tuning, describing astonishing performance of Tuska sets, listing these famous receivers and parts. Sent FREE! Address Dept. 5-U. The C. D. TUSKA CO., Hartferd, Conn.



C. L. PARKER Formerly Member Examining Corps, U.S. Patent Office. PATENT - LAWYER McGil Rég., Wach., D. C.

Patents, Trade Marks, Copyrights, Patent Litigation
Handbook for Inventors, "Protecting, Exploiting
and Selling Inventions," sent upon request.

for an injunction restraining the Automotive Accessories Company from further rendering this composition by radio.

The Federal District Court, speaking through Judge Hickenlooper, dismissed the case on the ground that this was no public performance for profit. The argument of the Court may be briefly summarized:

1. A strict construction of the statute is necessary. The law must be read according to the natural import of the words used. Radio broadcasting was not within the mind of Congress when using the term "perform publicly for profit."

2. In order to be a public performance in the sense in which Congress intended the words, there must be an assemblage of persons. "We simply feel that the rendition of a copyrighted piece of music in the studio of a broadcast station, where the public are not admitted and cannot come, but where the sound waves are converted into radio frequency waves and thus transmitted over thousands of miles of space, to be at last reconverted into sound waves in the homes of the owners of receiving sets, is no more a public performance in the studio, within the intent of Congress, than the perforated music roll which enables the reproduction of copyrighted music, by one without musical education, is a copy of such music. A private performance for profit is not within the meaning of the Act, nor is a public performance without profit. All contemplate an audience which may hear the rendition itself through the transmission of sound waves, and not merely a reproduction of the sound by means of mechanical device and electromagnetic waves in ether. The auditor listening in' at Indianapolis, Cleveland or Chicago would be surprised to learn that he had, that evening, attended a public performance in Cincinnati."

The third important decision to be noted is that of Remick vs. General Electric Company. The General Electric broadcast station (WGY) at Schenectady, N. Y., had broadcast the song "Somebody's Wrong," the copyright of which belongs to the Jerome H. Remick Company. The plaintiff petitioned the United States District Court of the Southern District of New York to enjoin the General Electric Company from further rendering this song by radio.

The Court, speaking through Judge Knox, refused to grant the petition on the grounds that the infringement of the copyright, if any, is committed by the performer and not by the owner of the broadcast station; the performer, if entitled by license to use the copyrighted music in any way, may extend his audience without incurring any further liability."

So far as the practical results are concerned, the broadcaster of the authorized performance of a copyrighted musical selection does little more than the mechanic who rigs an amplifier or loud speaker in a large auditorium to the end that persons in remote sections of the hall may hear what transpires on its stage. Such broadcasting merely gives the performer a larger audience and is not to be regarded as a separate and distinct performance of the copyrighted composition on the part of the broadcaster."

A CONFLICT

Thus it is apparent that the Federal District Courts are in conflict. It is generally admitted that most of the broadcasting performances are for profit—not for a direct gain, it is true, but for indirect profit, such as building up goodwill and maintaining the sale of receiving sets and parts. The owner of a broadcast station hopes, no matter what his business, to keep his name constantly before the public. The big problem is this: Is a broadcast performance a public performance, as intended by the framers of our Copyright Act?

What a Combination!



Price complete

\$35

Five-Tube Volume and Distance-Reflex Clarity

Here's a powerful little set! Two tubes do the work of five. Cuts Battery cost 60%. Gives consistent loud

speaker reception within a radius of 1000 miles—and we don't mean maybe! The

Shamrock-Harkness Two-Tube Reflex

is the result of months of investigation by Shamrock engineers.

Every part included in the licensed Shamrock-Harkness Kit has been especially designed for this circuit, carefully balanced to give maximum results. Avoid all imitations. The genuine Shamrock-Harkness parts are backed by our unconditional guarantee!

Also ask to see the improved SHAMROCK-HARKNESS THREE-TUBE COUNTERFLEX \$3950 The Wonder Set

SHAMROCK MANUFACTURING CO. Dept. 37-E, Market St., Newark, N. J.

SHAMROCK FOR SELECTIVE TUNING

The set for the masses as well as the classes

SHAMROCK MFG. CO.,
Dept. 37-E, Market St., Newark, N. J.
I enclose 10 cents (U. S. stamps or coin)
for copy of "Shamrock Radio Builders'
Guide Book" containing diagrams and complete illustrations for building 10 sets at
prices ranging from \$15 to \$50.

Name ..

KEYSTONE ARRESTERS FOR LIGHTNING PROTECTION

ELECTRIC SERVICE SUPPLIES COMPANY Phila.—New York—Chicago

HERCULES AERIAL MAST Write for

FREE

Blueprint

40 Ft. Mast \$25 60 Ft. Mast \$45 All steel construction complete with guy wires and masthead pulley. We pay the freight. 8. W. HULL & CO., Dept. A6 2048 E. 79th St., Cleveland, O.

Radio Instruction by Experts

Radio Operating Radio Mechanics Resident and Home Study Courses Send for Illustrated Booklet

Y. M. C. A. RADIO INSTITUTE

158 East 86th Street, New York, N. Y.

GO into the RADIO BUSINESS

We specialize in Equipping New Dealers with entire stock—advice free.

Send for Our Radio
CATALOG & BARGAIN LISTS
Wholesale Only
MANHATTAN RADIO COMPANY
112 Trinity Place
New York City

The Boy's Electric Toys

100 **Fundamental Experiments** in One Electrical Outfit

The Boy's Electric Toys contains: Enough material to make and complete over twenty-five different electrical apparatus without any other tools except a screw-driver furnished with the outfit. Student's chromic plunge battery, compass-

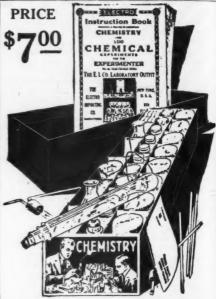
galvanometer, solenoid, telephone receiver, electric lamp, etc. Enough various parts, wire, etc., are furnished to make the following apparatus:

Electromagnet, electric cannon, magnetic pictures, dancing spiral, electric hammer, galvanometer, voltmeter, hook for telephone receiver, condenser, sensitive microphone, short distance wireless telepione, test storage battery, shocking coil complete telegraph set, electric riveting machine, electric buzzer, dancing fishes, singing telephones, mysterious dancing man, electric jumping jack, magnetic geometric figures, rheostat, erratic pendulum, electric butterfly, thermo-electric visual telegraph, etc., etc.

With the instruction book we furnish one hundred experiments that can be made with this outfit, nearly all of these being illustrated with superb illustrations. No other materials, goods or supplies are necessary.

PRICE





Chemistry Outfit

Embracing Over 100 of Nature's Most Startling Experiments

Most Startling Experiments

Think of it, fellows! Here is a real chemistry outfit with regular chemical apparatus that performs those fascinating, actual chemical experiments. This outfit is not a toy, put up merely to amuse, but a practical laboratory set, with all the chemicals, apparata and reagents necessary to perform real work and to teach the beginner all the secrets of inorganic chemistry.

The outfit consists of 44 Chemicals and Reagents all C. P. put up in appropriate wooden boxes, glass bottles, and hermetically closed jars. The acids are put up in glass bottles with ground-in glass stoppers, and there is a sufficient quantity of chemicals supplied (mostly one to two ounces) to make dozens of experiments with each.

The apparatus furnished are all of the best obtainable make and of standard laboratory size and shape. The Instruction Book is a real Chemistry Course for the Beginner. Some of the Contents are: Division of Matter: This is a Treatise on Elementry Chemistry and deals with the theory of the Elements, Molecules and Atoms, etc. Chemical Nomenclature: This explains in simple language the derivation of the chemical names of the elements and their compounds. There is a chapter on Laboratory Operations; Glass Working; First Aid; Fire Extinguishers; Experimenters' Aphorisms, etc.

A good part of the book is devoted to Weights and Measures. The Metric System, The English System and the U. S. System are fully explained.

The following tables are furnished: Symbols and Atomic Weights of the Elements; Measures of Weights, Volume, Capacity and Length; per cent solutions; Conversion of Measure expersed in parts; poisons and their antidotes; technical and common name of chemical substances; formulas for cleaning various substances, etc., etc.

Price \$7.00 Complete

SEND NO MONEY

We have so much confidence in these sets that we desire to ship either one to you by express C.O.D. with the privilege of inspection. In other words, we ship on approval. It does not cost you one cent to take a good look at whichever outfit you want, and see if it comes up to your expectations. If it does, pay the express man \$7.00, plus express charges. If not, you need not accept it, and we will pay the return charges as well.

ELECTRO IMPORTING CO., 233 Fulton St., NewYork City

	RN 5
	TRO IMPORTING CO., 233 Fulton St., New York, N. Y. Please send me "Boy's Electric Toys" " "Chemistry Outfit. If I decide to keep the outfit I will pay the full price upon delivery.
Name	
	98City and State

The final adjudication of this question lies with the Supreme Court of the United States. The Copyright Law of 1909 is very general. It merely says "publicly perform for profit," without mentioning any specific type of performance. Congress evidently saw that a public performance of the future might not be the same as a performance in might not be the same as a performance in 1909, so it couched the statute in general terms. "It is a general rule," says Sutherland, in his book on Statutory Construction, section 589, "that courts must find the intent of the Legislature in the statute itself. Unless some ground can be found in the statute for restraining or enlarging the statute for restraining or enlarging the meaning of its general words they must receive a general construction; the courts cannot arbitrarily subtract from or add thereto."

Congress has power to regulate interstate commerce. The founders of our government probably never dreamed of the railroad, the telephone and telegraph, and the airplane, yet one by one these instrumentalities have been, and are being, subjected to Federal regulation under the Commerce Clause.

The settlement of the copyright problem is an important matter of public policy. The problem is legislative rather than judicial. It is up to Congress to determine the rights of the owner of the copyright. The Courts interpret the law as it is, but Congress may change a statute so as to include broadcast-ing, if the courts say it is not included, or so as to exempt broadcasting, if the Supreme Court should decide that it is covered by the present law.

In order to settle this question, Senator C. Dill, of Washington, introduced into the last Congress bill No. S2600, which was intended to amend the copyright law by exempting the radio and the telephone from the operation of its provisions. The important change in the law comes near the end of section I:

"And provided further, That the copy-right control shall not extend to public performances, whether for profit or without profit, of musical compositions where such performance is made from printed or written sheets or by reproducing devices issued under the authority of the owner of the copyright, or by the use of the radio or telephone, or both.

Let us examine the effects of this bill. If it should be enacted I would have the right to purchase sheet music or a phonograph record and have it played in the public dining room, or in the auditorium of a theatre, or in a broadcast station without extra charge. The theory of the amendment is this: When I buy a sheet of music or the device for mechanical reproduction, I include in my curches representations. or the device for mechanical reproduction, I include in my purchase price an amount sufficient to pay the royalty accruing to the author or composer. He has already, then, received one fee, which is all the law ought to grant. It was never the intention of Congress that the composer should have the double right of selling his product to the public and then following it up and requiring further payment every time it is played ing further payment every time it is played in public. This is the theory and purport in public. of the bill.

THE BILL'S ARGUMENT

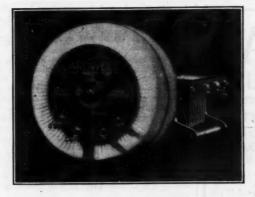
The arguments for this bill may be briefly summarized as follows:

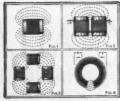
In the first place it will free radio broadcasting. On account of the great expense, the lack of direct income, and the instability of this new public utility, the proprietors of these stations cannot afford to pay royalties.

In the second place, it is unjust to permit the owner of a copyright to collect two fees for the same service. The owner of the copyright has already gotten his just desert from the royalty included in the price of the record or sheet of music.

Breadessting a new piece of music tends

Broadcasting a new piece of music tends





neral Theory of the Toro-Tran

and now the TORO-TR

CARDWELL, whose pioneer "low-loss" condenser established new standards of radio efficiency, is now introducing the Toro-Tran* - the ideal balanced coupling inductance for all radio frequency work. * TRADE MARK Registry applied for

The Toro-Tran eliminates signal energy picked up by ordinary coils from nearby stations. It eliminates magnetic feedback in multi-stage radio frequency circuits, thus removing the most active factor in causing howling and distortion and thereby increasing selectivity and distance. It rejects almost entirely the interference effects caused by electrical power machinery, elevators, door bells, arc stations, etc.

The Toro-Tran winding confines the field to the inside of the coil, a small area, and thus avoids one of the greatest causes of loss known to radio receivers that of stray magnetic fields which result in the absorption of signal energy and reduce the efficiency of the receiver tremendously.

Note these unusual advantages in assembly and operation

Compactness. The coils do not require spacing or angular mounting. They occupy less space than your condensers.
 Permit exact nullification.

for tube and stray capacity out guess work or tedio testing.

3, Closed magnetic field elimi-nates magnetic feed-back in tuned radio frequency am-

4. Low distributed capacity due to air spacing of each wind-ing and to low voltage-drop per turn of small diameter wire.

5. Maximum coupling and high ratio of voltage increase due to concentrated field with

6. Absence of all supporting insulation in the field of the coil. This is one of the great-

est loss factors in the ordinary circuit and is not remedied by "skeleton" or so-called "low-loss" windings.

7. Ease of neutralizing oscil-lation due to tube capacity by means of rotating control which anyone can "balance." 8. Low capacity between pri-mary and secondary, affording maximum transfer of energy to succeeding grid-circuit.

The Toro-Tran has a lower "circuit re-(i. e. effective resistance as sembled in a set and not as isolated in the laboratory for theoretical measurements) than any inter-stage tuned transformer made and has a correspondingly higher amplification factor, its ratio exceeding ten.

To appreciate the many remarkable advantages of the Toro-Tran write for our two free booklets: "The Torodyne Circuit" and "The Most Interesting Radio Frequency Transformer Ever In-

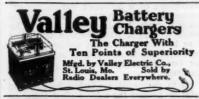
Toro-Trans are ready to mount in any tuned radio frequency circuit. Re-place your ordinary coils with ToroTrans. You will be astonished with the results. Most .00035 mfd. variable condensers will tune them, but by using Cardwell Condensers you get maximum efficiency.

Order from your dealer or direct

CARDWELL TORO TRAN WITH BALANCING POTENTIODON...\$ Cardwell .00035 Condenser for tuning... Cardwell .00035 Vernier Condenser... 6.25 Cardwell .00035 Dual Condenser (two-

Cardwell .00035 Triple Condenser (three-Cardwell Audio-Trans (compound audio

The Allen D. Cardwell Mfg. Corp. 81 Prospect Street, Brooklyn, N. Y.







BIG SAVINGS

On All Standard Sets and Parts

Dealers and Builders-Write for Quotations. You'll Find Our Prices Mighty Low. BROOKLYN RADIO SERVICE CO.
Myrtle and Classon Aves.

Brooklyn, N. Y.

aı

ne

th

m

cl

da

115

cl

lit

It

ne

al

to

w

th

CO

te

he

de

pl



ATLAS MATCHED TUBES INSTRUMENT TESTED

Made in All Standard Types

Guaranteed to function efficiently in the most

Every Atlas Tube is individually instrument tested.

Try them 30 days. Money refunded if you e not delighted. At best dealers, or direct from us for

Our guarantee includes safe delivery. Mail orders promptly filled.

SPECIAL OFFER: At no extra charge, we will until selected Atlas Instrument-Tested Tubes in atbed ests for Refex, Neutrodyne, Radio Frequency, uperheterodyne or other sets. They will improve the erformance of any set.

DEALERS: Atlas Matched Sets are in great demand.
Write or wire for proposition.



312 Caxton Building, Cleveland, Ohio 771 Ellicott Square, Buffalo, N. Y. 609 Chamber of Commerce, Pittsburgh, Pa.

Double and Triple Range Instruments No. 55

This instrument enables the set owner to make daily test of "A" and "B" from panel to set.

Ask your dealer to write for our 15-A Radio Instrument Catalog.

Jewell Electrical Instrument Co. 1650 Walnut St., Chicago

Make \$100 a Day

FREE INSTRUCTION TELLS

Many Sales Are Half Profit When
you sell our nationally advertised radio
sets and supplies. We Charantee your
success, under the "Gould Fian, by
your profit is and fire instructions
w To Sell Radio." Write for it.

Federal Radio Co. Hansas City, Mo.

REFLEX

Erla-Acme-Harkness Dealers: Send for Discounts

HUDSON-ROS 123 W. Madison St. Chicago to advertise it and to stimulate its sales. Since the owner of the copyright suffers no loss, and probably gains by the act of broadcasting, he should receive no extra

If the owners of copyrights are allowed to make this extra charge the effect will be cumulative. For example, how about the bootblack who places a radio receiving set in his shoe shining parlor for the enjoyment of his customers? Here, again, would be another public performance for profit. Surely, the advocates of the Dill bill say, the 1909 law cannot be intended to have such far-reaching effects.

But, the opponents of the Dill bill argue, whether broadcasting helps or retards the sale of music is really beside the question. As Judge Lynch said in the Bamberger case

"Our own opinion of the possibilities of advertising by radio leads us to the belief that the broadcasting of a newly copyrighted musical composition would greatly enhance the sales of the printed sheet. But the copyright owners and music publishers themselves are perhaps the best judges of the methods of popularizing musical selections. There may be various methods of bringing them to the attention of music lovers. It may be that one type of song is treated differently than a song of another type. But, be that as it may—the method, we think, is the privilege of the owner, he has the exclusive right to publish and vend, as well as to perform."

The owner's rights of copyright should be strengthened rather than weakened. Art, music and culture can be encouraged under our present state of society, by making special inducements to the authors. The private property rights in copyright should be maintained on a sound basis.

Against the passage of this bill the opponents argue:

Broadcasting should be placed on a sound economic basis so that royalties can be paid. Our big problem at the present time is the determination of who shall pay and how. If some adequate way of compensation were devised so that there would be a proper bal-ance between the broadcaster's income and expenditure, the broadcast stations could afford to pay royalties to the owners of the copyrights.

This is not a case of two fees for the same service, but of two fees for two different services. If I buy a sheet of music, the opponents maintain, and have it played private entertainment for my friends or relatives or at a public non-profit per-formance, I have paid one royalty charge. In return for that I acquire the privilege of paper and transforming them into things spiritual and mental. If I had not bought this sheet, this transformation could not have taken place. This is service number one.

Now, if I render that selection before the microphone of a broadcast station, the ex-penses of which I charge up to my general business costs, I am enabling many other people to hear it who otherwise would not have had the opportunity, unless they had purchased the sheet. This is service number two, for which an extra payment is

As to the question whether broadcasting helps or hinders the sale of sheet music or victrola records, it must be admitted that it is difficult to decide. The evidence is strong that the recent McCormack-Bori broadcast concert has stimulated the sale of Victor records. A considerable number of music publishers state that they have re-ceived orders for sheet music, which can only be explained by the fact that the purchasers have had their interest aroused by hearing these songs on the radio. Some of the

A Pleasant Surprise Awaits the User of the A.C.H. Sharp Tuner Dials WORM DRIVE



4 in. DIAL -ACH - (215-t0-1) Money Back Guarantee Money Dack Justantee
rice 3-inch size...\$2.0

gular fitting 5/16 shaft ½ and 3/16, 5e each extra

EXTRA ADVANTAGE OF THE A.C.H.

Can be attached or removed from any instrument.

Bough tuning same as any dial.

Movement so fine that the eye cannot detect but the

3 In. DIAL - ACH - (156-t0-1)

- Movement so fine that the eye cannot detect but the ear can.
 Automatically locks instrument so no jar can disturb it.
 Dial grounded reducing the body capacity to a minimum.

Special dial 2 graduations where ordinarily one.

Mail Orders Sent Prepaid in U. S. A. A. C. HAYDEN RADIO & RESEARCH CO. 25 E. Battle St., BROCKTON, MASS., U. S. A.

Mr. Radio Jobber:

A small Eastern town ordered 750 A-1 CRYSTALS in three weeks through the recommendation of one satisfied user to another .- SAN FRANCISCO bay city jobbers distributed 9,000 in 30 days.

The WONDER CRYSTAL

FIFTY CENTS EACH



Jobbers write for Discounts California Radio Minerals Harry Grant, Jr. 904 Oak Grove Ave. Burlingame, California

STATIONERY PERSONAL 200 SHEETS and 100 ENVELOPES Address

Printed with your Name and Address
Clear, white bond paper, with envelopes to match. Your name and address printed in beautiful, rich blue ink, on both paper and envelopee, and sent to you postpaid for only \$1.00. (West of Mississippi river and outside of U. S. \$1.10.) If inconvenient to send the money, we will ship C. O. D. Money returned if you are not more than satisfied. Order today. Wite mane and address plainly. AGENTS MAKE BIG MONEY taking ordern Write

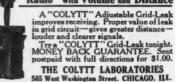
ELITE STATIONERY COMPANY
7056 Main Street Smethport, Pa.

NEW RADIO TUBES

Meter \$2.00 Matched Guaranteed Types 012, 0199, 0200, 0201A y type when ordering. We ship Parcel

Post C. O. D.
OHIO RADIO SALES
723-H Rose Bldg. CLEVELAND, OHIO

"Radio" with Volume and Distance



Insure your copy reaching you each month. Subscribe to RADIO NEWS—\$2.50 a year. Experimenter Publishing Co., 53 Park Pl., N.Y.C.

theatre owners and music publishers apparently forget that the advent of radio will multiply popular interest in music, and that in the future there will undoubtedly be room

Radio in the Cave Disaster

(Continued from page 2073)

splice between this point and the lamp, the amplifier was turned on. My idea was that if there was a loose connection on the lamp socket on Collins' chest, that being looped in series with the primary of the amplifying transformer, dry cells and milliameter, any move he might make or even his breathing would move the socket enough to make a break or partial break in loose socket connection, which would be stepped up through the transformer and amplifier and make a

sound in the head set.

The first day of this test (February 8) sounds were heard at times as if the socket were being moved, but the milliammeter showed the circuit closed most of the day. The second day the milliammeter showed that The second day the milliammeter showed that the connection at the lamp socket was not so good, and the head-phones registered a steady click like the making and breaking of a connection from 18 to 22 times per minute. At times it would run up to 30 clicks a minute, and on the last day of test it slowed down to 12 per minute. For two days this sound continued without missing a time. Physicians who listened to this test a time. Physicians who listened to this test with me, stated that these impulses or clicks corresponded with the normal respiration. There was no other sound heard from outside or any interference, as no detector was used. Everything was as still as death. All used. Everything was as still as death. All that could be heard was the regular click, click; only a few times a scratchy sound was made as though he had moved just a little. On the third night of this test, this circuit to the lamp on Collins became open. It seemed that the bulb was out or the connections broken and we failed to get any further results.

We had a man go as near Collins as possible and rub the wires together, moving them about to see if we could find another way to make this click, but it failed to make any sound and the steady click still came through when he returned. As there was no one in the cave beyond or between where we were the cave beyond or between where we were testing and Collins at any time, only when this man was sent in to see if he could make the sound, and no outside interference that could have made this sound, it seems that it could not have been anything but Collins' breathing causing the lamp socket to rise and fall and make contact.

This is an authentic description of the test as I furnished the apparatus connected.

test, as I furnished the apparatus, connected it up, and made the test personally. And no one else knows the circuit I used. This is the first time it has been given out.

Some newspapers made the false report when this test was first made that we could have his test was first made that we could

hear his heart beating, and other sounds that could not have been heard without a microphone instead of a light bulb.

The Radio Inauguration

(Continued from page 2059)

safe to say that something is interesting it exceedingly. And that is what happened on the above date. Restaurants were almost deserted until after 2 o'clock, for the vast invisible audience went hungry rather than miss a single word of the program.

Very few people who took such great pleasure in listening to the broadcasting of

The New NAVY MODEL C-10 SUPER-HETERODYNE



Only 2 Main Tuning Adjustments for 10 Tubes Panel Size Only 28 3/16" x 8"

A POWERFUL 10 TUBE BROADCAST RECEIVER

having a range and degree of selectivity far in advance of any receiver.

> Total Amplification 1,500,000 Times Wave Length Range 50 to 600 Meters

This new design by Charles R. Leutz represents final superiority over any receiver now being manufactured or even contemplated for broadcast reception.

Descriptive Literature Mailed on Request

Experimenters Information Service, Inc. 476 Broadway

New York City, N. Y.

Designers of the Highest Class Radio Apparatus in the World.

the Highest
Apparatus
Please forward literature
Navy Model Please forward literature on the New

......State......

ON THE OCEAN FRONT

CAPACITY 1000

The Breakers

Atlantic City, N. J.

American or European Plan

Sea Water in All Baths

ORCHESTRA DANCING

AFTERNOON TEAS GOLF PRIVILEGES

CABINET BATHS FIRE-PROOF GARAGE

JOEL HILLMAN, President

Insure your copy reaching you each month. Subscribe to Radio News-\$2.50 a year Experimenter Publishing Co., 53 Park Place, N. Y. C.

Here's the Great Hookup Magazine.



A Digest of the best Hookups the world Over The only magazine of its kind in existence, contains circuits of every description gathered from all over the world. All articles are of constructional nature and are fully illustrated with pictures, diagrams, etc. Each circuit is described completely and in detail. All the latest hookups will be covered. No advertising. This means one hundred full pages of data and information for use. Magazine is of the large size, 9 by 12 inches, printed in a handsome 3-color cover.

In each issue is a special supplement of S. Gernsback's Radio Encyclopedia—this is not a dictionary but a regular encyclopedia explaining fully every radio word. The supplement is profusely illustrated and is the most up-to-date and complete radio reference ever published.

Copies are now on sale everywhere, but if you cannot obtain a copy in your district write direct to us, enclosing 35c, and we will forward you a copy postpaid. Subscription \$3.50 for 12 issues.

SOLD EVERYWHERE—AT ALL RADIO AND NEWSDEALERS on write direct enclosing 350 If your dealer cannot supply yo

The Consrad Company, Inc.,

233 Fulton St., New York, N.Y.

such a program realized just how much labor was involved in the undertaking. After the speech was picked up by the microphone on the speaker's desk it went to controls under the platform, from which it was led to the power amplifiers in the telephone exchange. Here the signals were put on the land wires leading to the different stations throughout the country, where they were put on the air.

Very few people who were gathered around the platform in Washington noticed a very busy gentleman on the grounds, with a microphone strapped on his chest and a pair of phones on his ears. This gentleman was the monitor. He could plug in at will on any of the lines that left the platform and ascertain just in what manner the speech was going through. However, he was not the only one to watch to see that nothing interfered with the radio program. Every 200 miles of telephone lines had power amplifiers and at these points, too, were men who were performing the same duties of monitoring and watching. In case anything went wrong with a land wire, there were other wires available at an instant's notice, so there would be no break in the speech. All these telephone lines had to be in-

spected thoroughly to see that they were in the best of working order. This, in itself, was a task that required weeks of patient labor and testing. In order that there should be no interference whatever from induction, static and all the other things that make the life of a telephone engineer miserable, spe-cial filters were installed in these lines to eliminate such interferences as far as possible. All this special apparatus had to be watched over with as much care and consideration as any other portion of the equip-

ment.

This is really the first time that the fact that radio is more and more becoming a necessity to the country as a whole, has been demonstrated. As we have mentioned above, there have been other simultaneous broadcastings, but never has there been an event broadcast of such tremendous interest to the Every citizen of the United States has a voice in the choice of a President and what could be of greater interest to every citizen than what the man he has elected presents in his inaugural speech? It is true that this speech is printed the following day in all the newspapers, but there is a personal touch in the radio reception that it is impossible to give in the papers.

The Month in Radio

(Continued from page 2065)

On the lonely ranges of Southwest Texas an aged sheepherder nightly listens to the an aged sneepherder nightly listens to the musical concerts broadcast by radio sending stations in Dallas and Fort Worth, Texas. The sheepherder, according to a legend of the Big Bend district, drifted into the wilds of the border country years ago and has always been a man of mystery, but was known to entertain a great love for music. known to entertain a great love for music. For almost 20 years the recluse followed the herds over the lonely foothills of the sheep country. With the perfection of radio the sheepherder one day ventured to El Paso and bought a receiving set. Now the old man sits in the evenings by his campfire in some western arroyo with only his dog for company and drinks deep of the art flashed to him through sace. to him through space.

Mrs. Miriam A. Ferguson, Governor of Texas, the world's most talked of woman, is a devoted radio enthusiast. When she is a devoted radio enthusiast. entered the Governor's mansion at Austin as the first woman governor of the Lone Star State, one of her hobbies was radio.

Only specialists can make good fixed condensers

THE small fixed condensers in your radio set are there to help you get clear reception. If these little condensers are not made most accurately the quality of reception you get - even though your set may be excellent in all other respects — will be greatly impaired.

You will find that nearly all sets made—in fact over 90% of them—are equipped with Dubilier Micadons. This is the name by which all Dubilier fixed condensers are known.

Be sure your set—whether you buy it or build it -is equipped with Micadons. They are made by specialists.

CONDENSER AND RADIO CORPORATION



LVERTRO

25 The Fastest Selling Guaranteed Tube TO-DAY AT NEW LOW PRICE

BETTER THAN EVER — LONG LIFE — CLEAR RECEPTION
The Silver Tube with the Golden Voice.

102A 5 volts operates se either Detector or Type 112—14 volts, Ampl. and Detec. Amp. 14
plifier on 14 amp. filament consumption. The Type 112—14 volts, Detector on 17. Amp. 1-5.
all Tubes for Neutrodyne and Super-Heterodyne. Type 309 3-4 volts, Detector and Ampl. Amp. .06
ent C.O.D or parcel post prepaid, carefully packed to any address on receipt of \$2.25 SILVER - TONE



1st Stage A New Audio Frequency Transformer 2nd Stage
Better and Clearer Reception You Never Experienced; the Last Word and Achievement in Radio. BUY A PAIR - THEY ARE MATCHED MONEY BACK GUARANTEE \$5.50 Pair \$3.00 Each DEALERS and JOBBERS—Write for Discounts and Circulars.

NEW YORK RADIO COMPANY

71 West Broadway

New York City, N. Y.

\$100 A WEEK

For Your Spare Time

How would you like an extra \$100 a week? That is just exactly what you can make, and just as much more as you want—it's up to you. Others are making more. You can surely make at least a \$100. Read what C. Brown of New Mexico says:

"Please rush the enclosed order of five sets at once C.O.D. I received my set O.K. Thursday night and I sold these five sets yesterday and today. It is the easiest money I ever made and I think I am due to sell about 25 more within the next two weeks. Thanks for giving me this opportunity."

—C. BROWN.

You see what this chap did in two days—made \$125 for himself, and you can do it too. This is the easiest, quickest radio selling outfit on the market as well as one of the most effective. It brings in distance—plenty of it, 3,000 miles and more. Sales are easy to make, because you are selling direct to the consumer, from an old, well established, nationally known manufacturer. That is one of the reasons sales are so easy to make. This is a new plan in selling radio sets.

No experience necessary. Just write me at once for full information and I will tell you how casy you can make a lot of extra money. Send me a postal card right now with your name and address before you forget it. Territories are going like wildfire, so don't miss this opportunity. Rush your name and address to me today.

Al Reed, Sales Manager 88 West Broadway, New York, N.Y.





Radio Tubes

Distinctly New and Efficient.

A quality these at a moderate price,
made possible by our direct sales
plan. "Bluebird" is sensitive and
powerful — produces more volume
with clearness.

Type 400 ... So Volts. 1 Ampere
Detector Tube.

Type 401A ... Detector.
Amplifier and Detector.
Type 400A ... 34 Volts. 25 Ampere
Amplifier and Detector.
Type 400A ... 34 Volts., 06 Ampere
With Standard Base.
Type 410A ... 1½ volts. 25 Ampere
Platinum Filament.
Amplifier and Detector.
Type 402 .5 Watt Transmitter \$3
ALL TUBES GUARANTEED
to work in Radio Frequency. Especially adapted for Neutrodyne. Refer and Super-Helerodyne Sets.

BLUEBIRD TUBE CO.

Spaulding RADIO PANELS SPAULDING FIBRE COMPANY TONAWANDA, N.Y.

"Ma" Ferguson took with her a receiving set which will permit her to listen in evenings and keep in touch with the world's The great Texas woman dehappenings. clares that her recent months have been so filled with activities that she has had but little time to read the newspapers. There-fore, she plans to substitute the bulletin news review of various broadcast stations of Texas newspapers. These crisp little pieces of news give all the big world and state happenings in condensed form and Mrs. Ferguson plans to make the most of the innova-

Radio has reached the heart of the hardened border outlaw, according to a story told by Texas Rangers. A Ranger captain on duty in the Big Bend district declared that when he raided the rendezvous of a notorious band of Mexican bandits in an isolated box canyon near the Rio Grande, the robber gang fled in such haste that the camp fixtures were left behind. receiving set was on a small table and the Ranger captain, picking up the ear pieces, listened to a dreamy waltz, tinged with the love and romance of Mexico, evidently played by some orchestra in the Southern republic.

Correspondence From Readers

(Continued from page 2106)

"For half an hour or so, Pickard and his accomplice sent rambling sentences, single words-anything they could think of handily to pound out into the ether. Pickard, how ever, was something of a poet and he called to mind Scott's 'Lady of the Lake.' No sooner had he begun to call up the lines in his memory he began to give the other operators listening in a lesson in English litera-ture. Complete, it was, even to the capital letters at the beginning of the lines and the flourishes between the Cantos. When he tired, his pal, Shoemaker, filled the ether with English, not so classical as profanely expressive!"

I regret that I must deny this soft impeachment. In 1903 I was in Boston, working on radiotelephonic development in the laboratory of the American Telephone & Telegraph Company. In view of this fact, it is perhaps unnecessary to add that I loathe Scott, and have yet to complete my education by reading the "Lady of the Lake" in its

Will you be so kind as to publish this little correction? Possibly this will embolden the real etheric poet to come forward and take his laurels.

> GREENLEAF W. PICKARD, Newton Center, Mass.

BRITISH VS. AMERICAN BROADCASTING

Editor, RADIO NEWS:

It seems that in the March, 1924, issue of RADIO News you published an editorial which aroused the ire of one Mr. Bayes who resides at 48 Lavender Gardens, London, S.W., England.

In the June, 1924, issue of your publication you printed a letter written by Mr. Bayes, which severely criticized your editorial, and American broadcasting in particular. In your September, 1924, issue you published my letter which attempted, in a small way, to answer Mr. Bayes and incidentally to throw some light on English broadcasting as seen from a commercial operator's viewpoint at sea.

In the December, 1924, issue of RADIO EWS, you published another letter from Mr. Bayes in which he replied to his critics



FOR GREATER DISTANCE VOLUME AND CLARITY

As no two tubes or circuits of the same make require the same condenser values, we suggest for 100% efficiency the—

X-L VARIO DENSERS

MODEL N—Capacity range 1.8 to 20 micro-micro-farada, for balance in Roberts two tube, Browning-Drake, McMurdo Silvers four tube Knockout, Neutro-dyne and tuned radio frequency circuits. Price. \$1.00 MODEL G—Capacity range, 0.0016 to .00055 micro-farada, for the Cockaday circuit, filter and intermediate frequency tuning in super-heterodyne and positive grid bias in all sets. Price. \$1.50 Endorsed by all the leading radio authorities and publications in the country.

Write for descriptive circular. X-L RADIO LABORATORIES 2424-26 Lincoln Ave. CHICAGO



To the Man with an Idea

To the Man with an Idea I offer a comprehensive, experienced, efficient service for his prompt, legal protection and the development of his proposition. Send sketch, or model and description, for advice as to cost, search through prior United States patched through prior United States patched, etc. Preliminary advice gladly furnished without charge. My experience and familiarity with various arts frequently enable me to accurately advise clients as to probable patentability before they go to any expense. Booklet of valuable information Booklet of valuable information and form for properly disclos-ing your idea free on request. Write today.

RICHARD B. OWEN PATENT LAWYER

2 Owen Building, Washington, D. C. 2276A Woolworth Bldg., N. Y. City

If you have an invention and desire to secure a patent, send for our Evidence of Invention Blant and free guide book, "How TO GET YOUR PATENT." Tells our Terms, Methods, etc. Send model or sketch and description of your invention for INSPECTION and INSTRUCTIONS.

No Charge for the Above Information

RANDOLPH & CO., Dept. 459 Washington, D. C



NAVY

Telephone Transmitter and 2 Step Amplify-ing Receiver, complete with 12 to 350 V. Dy-namotor, Microphone

and Headset. Price without Tubes or Batteries — New Ones \$60. Used Ones \$35. EXPRESS PAID. GEO. W. EATON ELEC. CO. 1915 S.12 St., Phila.Pa.



"**Lighting Fixtures"
READY TO HANG
(Direct from Manufacturer)
Completely wired including glassware.
Send for Catalogue No. 26.
(Just off the Press)
Special Proposition to Dealers ERIE FIXTURE SUPPLY CO. STATION R

using his customary sledge-hammer phrase-ology. In this letter of his he refers to me as being a "First-class distorter of the truth" and he also says: "I have no peeve against the Yanks, but I have against those who lie about my country." He didn't ex-actly call me a liar, but it wouldn't have been any worse if he had said so in less uncertain terms. Permit me to say that I am not at all offended by his remarks, but am not at all offended by his remarks, but would wish to ask you as well as Mr. Bayes to kindly look up the facts referred to and learn if I told the truth or not. I will then not fear the final verdict.

I have now made my sixth and last trip to England aboard this vessel and have had a fair opportunity to observe British radio, both broadcasting and commercial. I have purchased considerable radio apparatus in British stores, worked their commercial land stations and listened attentively to the oscil-lations of the B.B.C. I also purchase all the wireless magazines on sale at public places and read them quite thoroughly. I might say that I have also worked many British vessels and have visited the radio room of a few of them. These remarks are merely to give you a background to judge whether or not I am capable of judging, even in a small way, the efficiency and moderness of British radio.

First of all I would like to compare some results obtained by me in listening to American broadcast stations from the time our vessel left San Pedro, Calif., until it was close to Britain's shores, with those obtained close to Britain's shores, with those obtained in listening to British stations. On leaving San Pedro I clearly and distinctly heard WTAM, of Cleveland; KYW, of Chicago, and KFKX, of Hastings, Nebr. These stations were heard when less than twenty-five miles from San Pedro breakwater. On the miles from San Pedro breakwater. On the way down the west coast of Mexico and Central America I distinctly and clearly heard all the principal stations of the west coast such as KHJ, KPO, KGO, KFI and the station at Calgary, Canada. Several stations in Texas, KSD, of St. Louis, and another at Kansas City, all came in loudly and clearly on the SE 1420 U. S. Navy type receiver. Every night down the west coast receiver. Every night down the west coast until less than 1,000 miles N.W. of Balboa I heard from one to five stations located more than 2,000 miles from our ship.

On account of static no further effort was On account of static no further effort was made to hear music until about 250 miles N.E. of Colon while in the Caribbean Sea. I then began again to listen to American broadcast stations. From this time on, until our ship was within less than 500 miles of London, I clearly and distinctly heard from one to six American broadcast stations each one to six American broadcast stations each evening. The nearest point to American soil was about 1,500 nautical miles and the far-thest was about 2,500. When one realizes the fact that our course was almost directly up the middle of the Atlantic and such a long way from most of the high class stations, the record is not a bad one. For three tions, the record is not a bad one. For three or four nights we were in the midst of a heavy gale which swept the North Atlantic and rocked our ship badly, but in spite of the heavy rolling KDKA and WBZ, as well as WGY, came in quite loudly and clearly 2,500 nautical miles away. One night we heard Kansas City and on another Daven-

I do not mention the above in order to brag about what was accomplished, but merely to show that my receiver was in good working condition, and I believe it indicates to a liberal mind that if British broadcast stations are a could have been decided as a contract of the could have been decided. as American stations, I could have heard them about as far. I see no reason why a British station should not carry as well out into the Atlantic in a westerly direction as an American station does in an easterly direction, but they do not seem to.

I was able to hear the carrier wave of



Young Men—Turn Your Spare Hours Into Money!

Earn big profits, prizes, and awards selling RADIO NEWS, SCIENCE & INVENTION, The EXPERI-MENTER, and MOTOR CAMPER & TOURIST in your neighborhood. We train you as our salesmen and pay you liberally for your time. Write at once and we will help you get started. M. BRIDWELL

THE EXPERIMENTER PUBLISHING CO. 53 Park Place New York, N. Y.

Complete List of Titles in the E. I. Co. Books

All About Radio Parts

Everyone who constructs a radio set should know the simple fundamentals of the various parts of his set. The E. I. Company has set these forth in a compact little book that is valuable at all times.

Book No. 8—Price 25c

History and Operation of the Vacuum Tube

The Vacuum Tube is a marvelous piece of apparatus. A short study of it as given in this book gives you the principle on which every Vacuum Tube Radio Receiver operates.

Book No. 9-Price 25c

The Neutrodyne-All About It

Everybody knows the famous Neutrodyne hookup, One of the finest Radio Receivers fin use today. This 51-page E. I. Company book gives an explanation of every detail of the Neutrodyne and how it all works.

Book No. 10—Price 25c

How Radio is Received

The simplest and yet most complete Radio Guide Book for any amateur broadcast lis-tener. In print only two weeks, fresh from the press.

Book No. 11-Price 25c

How to Locate Troubles in Your Radio Set

Anyone with this handy book as a guide can renair and keep in order his own radio set. Corers every detail of the modern radio sets and tells how to locate and repair any trouble.

Book No. 12- Price 25c

Radio Reflex Receivers

Just off the press. Hookups galore on the finest and most up-to-date reflex circuits in use today. Diagrams and descriptions on every modern reflex.

Book No. 13—Price 25c

Tips for the Radio Amateur Constructor

Many men fall in building their Radio sets because of some trivial error that could easily have been corrected before it was too late. The E. I. Company has compiled a book that will help you avoid all the common pitfalls while building your Radio sets.

Book No. 1—Price 25c

How to Make PRACTICAL Radio Receiving Sets

The man who wants to build only those PRACTICAL Radio Sets that are guaranteed to give good results when properly constructed will need this book. Gives the principal successful hookups of practical Radio Construction.

onstruction.
Book No. 2--Price 25c

Radio Questions Answered

Question No. 1.—What is Radio? This is the nature of the questions that this book, answers. Then it answers questions on all the principal parts of a Radio Receiver. It is a hand book to keep in your Radio File Book No. 3.—Price 25c

Radio Frequency Amplification

Distance lends enchantment—and it's the Radio Frequency Amplification that brings in the distance on your Radio Receiver. If you contemplate adding any Radio Frequency to your set you will want this book at your side.

Book No. 4—Price 25c

How to Tune Your Radio Set

Don't struggle in the dark, looking for sta-tions—here is an inexpensive book that government of the structions on just how to handle your Radio set. You will be sur-prised at the increased results that can be obtained through proper tuning.

Book No. 6-Price 25c

100 Radio Hookups

No better book for your work bench. Gives diagrams, hook-ups and details on Radio Hook-ups galore. One of the most complete hook-up books published. Authentic and up-to-date in every respect. Third edition

Book No. 7-Price 25c

E. I. Co. Books

are sold throughout the country by all Radio and News Dealers

If Your Dealer Cannot Supply You, Write Direct



Any radio receiver will give better results if you learn more about it

NY radio receiver gives better results in the hands of an experienced radio man. The reason for this lies not in their intimate knowledge of radio parts but rather in their fundamental knowledge of how the receiver operates.

The radio books of the E. I. Company are written with this sole object in view, to give the average broadcast listener the fundamental knowledge that will enable him to understand the care and operation of the receiver he buys or builds.

Some of the E. I. books cover only the care and operation of general radio receivers, others cover the construction and operation of specific types of receivers, while a third class cover that intimate, general knowledge of radio transmitting and receiving that everyone should know.

Glance over the titles of the books listed on this page. They are sold everywhere. Or, if you wish you can obtain them direct from us.

All E. I. Co. Books are 25c. Each

Published by

E. I. Company, Inc.

The Constad Co Sole Distributors

233 Fulton Street

New York, N. Y.

5XX, the British station at Chelmsford, at a distance of 2,100 nautical miles, but speech at this distance was not audible. When at a distance of 1,800 miles, the words of the a distance of 1,800 miles, the words of the announcer could be distinguished but the signals were weak. At a distance of 1,500 miles the voice and music were received quite well, but I believe not as loudly as WGY, KDKA and other American stations when 2,500 miles away. This seems very peculiar, owing to the fact that 5XX uses 25 kilowatts of power, while the highest powered American station is listed in the U.S. Government radio call book as one S. Government radio call book as one kilowatt. I might add that I made a special effort to receive this station at distances greater than those mentioned, but found it utterly impossible to do so.

Just why British broadcast stations use so, much power and radiate such a small quantity into space is an enigma to me. But I am strongly suspicious that it may possibly be due to the poor quality of the apparatus, the type of circuit used, or perhaps ineffi-ciency in the operating personnel. The chief engineer of the B. B. C., Capt. P. P. Eckersley, said in your December issue that the chief difference between American and British broadcasting lies on the technical side. I think everyone who has attempted to listen to an English broadcast station at an appreciable distance will agree with him in that statement. There is a technical difference, and it probably accounts for the poor radia-tion of English stations. Capt. Eckersley said in the same issue of your magazine that radio engineers are agreed that 30 or 40 miles is about as far as one can hear music when the transmitting station is using one and one-half kilowatts of power. He said this is as far as you can hear it so as to enjoy it.

In Radio News, for September, 1923, Dr. J. A. Fleming said that a ½ k.w. transmitter gives a range of 100 miles in daylight. In the article referred to, Prof. Fleming was writing and describing a Marconi tube radiophone and C.W. transmitter. In my letter published in the September, 1924, issue of Radio News I quoted from the Harmsworth Encyclopedia, showing that 520 miles was the greatest range that British scientists expected to get from the best of receiving sets. Mr. Bayes took me severely to task for quoting this authority, claiming it was no authority and that I knew it, nevertheless Sir Oliver Lodge is a consulting editor and Dr. J. A. Fleming is a contributing editor. On page 5, of British tributing editor. On page 5, of British Radio, the wireless quarterly, the writer has this to say: "I propose to describe in this article a simple four-valve receiver which can be relied upon to give excellent loud speaker reproduction at moderate ranges, say, up to 30 or 40 miles from any one of the main broadcast stations." Just think of the main broadcast stations." Just think of it, using four valves while the transmitter is using 11/2 k.w. to 6 k.w., and 5XX uses 25 k.w., and then being able to get good results only 30 to 40 miles. I say now, as said before, that something must be wrong with British radio. A new station is now under construction at Daventry which will consume 100 k.w. of power and perhaps when it is finished one will be able to hear it as far as an American 500-watt station, but I sincerely doubt if it will at all excel it.

The plain truth of the matter is that European stations do not radiate energy as well as American stations. They consume much more power and cannot be heard half as far. When it comes to listening to 2LO and other British short wave stations, it isn't worth the trouble unless you are less than 1,000 miles away. In fact, I still stick to the 520 miles as being a good distance for 2LO where you can really enjoy the music. At greater distances the difficulty in tuning him in and the weak signals are not worth the effort involved. It is possible to hear him further and I am willing to admit this,

A Radio Expe



Pleasant Home Study

During the next few months you can, by devoting a few hours each week in pleasant home study, qualify yourself to get into the biggest paying field of all time. My practical, understandable course of instruction enables you to be a Master of the Air. Every problem in radio becomes an open book to you. Be a Master of the Air and you will be a master of your future.

\$3.000 to \$10.000 a Year as Radio Expert

15,000 ships, hundreds and hundreds of Radio stations, with new ones springing up every day, are all keenly competing for the services of the radio-trained man. So enormous is the call for the radio expert that the man who knows his business in this field is in a position to command the size of his salary. On land or sea, in Government or private service, there are boundless fine paying opportunities for the man who understands radio problems and how to solve them.

where Knowledge RADIO is Power and Power is Cash

I show you how to construct, install, operate, repair and sell radio equipment. Instead of being a spectator in this big game with big stakes, you become an active player. I qualify you to handle every branch of radio. There is nothing theoretical or practical that is not presented to you in complete, concise form. You are standing face to face with the greatest money-making chance ever presented to you. Will you turn your back on it or will you decide now, once for all, that you will get your share of the millions being divided among radio-trained men? Right in your own neighborhood you can make easy profits. Neighbors and friends will gladly give orders for sets and pay for advice on radio problems.



FREE 1000 Mile

This set, when completed, has a range of over a thousand miles, I give it free with my course. I give you practical training by having you work on, this set. The knowledge you gain is, not mere book knowledge, but is usable, practical experience. When you have finished my course, you can sell this set at a price that will more than pay the cost of the course.

A. G. MOHAUPT, B.A., M.S.
Head of the Radlo Association of America. Graduate
Electrical Engineer,
elity of Wisconsin. Former
Radlo Instructor for U. S.
Government, Author of "Practice and Theory of Modern
Radlo."

personal attention tudent taking my ir Individual prob-

QUICK PRACTICAL TRAINING

Everything in my course is clearly and simply stated so that you can easily understand every point I bring out. No previous experience or education is required. I give you fundamental and practical training in every angle of radio. There is no time to lose. Now is the best time to pass the other fellow by. Mail coupon today and get full information on my course, also details of the thousand mile set that I give free.

A. G. MOHAUPT, Radio Engineer RADIO ASSOCIATION OF AMERICA 4513 Ravenswood Ave., Dept. 155, Chicago, Ill.

 MAIL	COU	PON-

A. G. MOHAUPT, Radio Engineer, Radio Association of America, 4513 Ravenswood Ave., Dept. 155, Chicago. Please send me details of your Home Study Course—also your Free "Radio Facts" and information on how I can get a FREE 1,000 mile Radio Set.

Loud Speaker Unit TYPE D

A quality product with clear, bell-like tones and ample volume without harsh distortion. List price \$4.95. Phonograph adapters, finished in highly polished aluminum, designed for Victor or Columbia phonographs.

EASTERN ELECTRIC COMPANY Elizabeth, N. J.

TUBES REPAIRED

Only middle west tube service station hour service. No extra charge for broken glass.

WD-11, WD-12, C-11, \$9.25 WD-11, WD-12, C-12 UV-201, C-301 UV-201-A, C-301-A, UV-199, C-299 All styles DeForest UV-200, C-300

Discounts in quantities of six or more. May be had in assorted styles. We pay the postage. Write for bulletin of other products.

Dey's Radio Service Dept. 15, 5947 Superior St. Chicago, Ill.

Insure your copy reaching you each month. Subscribe to Radio Newsyear. Experimenter Publishing Co., 53 Park Place, N. Y. C.



Rolling Mill Products

Condenser Plates. Special Stampings. Horns. Charger Cases. Shield Metal. Anything made Shield from ALUMINUM! Send blueprints for our prices or estimates.

RADIO DIVISION Aluminum Products Co. LaGrange, Ill.

NEALERS Stand Each month BUSCHER at Kansas City broadcasts lower prices on Standard Nationally Advertised RADIO Equipment.
You lose money if you fail to "tune in." Your name on our mailing list will pave the way for bigger profits. Write today.

C. A. BUSCHER CO.

1225 Lecust St. Kansas City, Mo.

DON MAC CO., INC., 29 SOUTH DES PLAINES STREET ILLINOIS CHICAGO

but for distances much over 500 miles 2LO is not worth listening to and I am willing to wager that everyone who has attempted to with an ordinary receiver will admit this

As far as my experience goes the British stations are the best in Europe, and that is about all the praise one can offer. No fault can be found with the quality and tone, and the programs are quite good as a rule. They have improved greatly during the past year. The long delays between items on the program are an annoyance and a nuisance and should be abolished. The announcers are altogether too brief in their remarks and not as capable as the average American announcer.

If the harmonics of the high-powered stations of English were abolished, much less interference would be experienced. I heard the harmonic of GBL on 2,200 meters 450 miles west of the Isle of Wight and GBL is supposed to work on 12,200 meters. I heard the harmonic of GKU on 450 meters about the same distance and GKU is supposed to radiate on 2,100 meters. anothed bad offender, but he is a Frenchman. 5XX is also a bad offender. I heard one of his harmonics on 450 meters, 245 miles west of Southampton. It seems to me that if British radio control were as efficient as Mr. Bayes claims it is, the G. P. O. would see that these stations were improved.

If you read an English magazine and desire some information on radio, it will cost you two shillings and six pence (about 60 cents). British radio publications do not give out information free of charge. If you think British radio apparatus is comparable to American, take a look at the British tube socket, the clumsiest piece of apparatus you can imagine. Great care must be exercised or the filament will be burned out by the high tension battery owing to the fact that you can't tell how to insert the tube until you have tried every one of the four dif-ferent ways of how it might go. One type of Brown phone has a resistance of 120 ohms and sells for 22 shillings and 6 pence or a little over \$5. These phones have a crude metallic head piece which pulls your hair and are anything but comfortable. The better type of Brown phone sells for 58 and 62 shillings or nearly \$15. Again the idea of mounting tubes on the outside of the cabinet is a poor one which destroys the beauty effect, there perchance should be any, and besides leaves them exposed to breakage.

Just where the British stand in commercial radio can be imagined when one looks for a Radio Beacon on a foggy night. will appreciate this if you happen to be a commercial operator. It is a rainy, foggy night and the compass stations are all busy (both of them) and the captain wants to know the ship's position. On board we have the latest marine safety device, the Kolster Radio Direction finder using six tubes. We are entering the channel after three days of heavy gale and no sun to "shoot." I tune and tune in vain to find a radio beacon working and I conclude they don't have them over there yet. The best I can do is to wait until FFU and GLD begin working and I get the best bearing I can from their signals.
Compare this situation to the numerous automatic transmitters around both American coasts which make it possible to get a bearing at any time during foggy or rainy weather. In commercial radio as well as in broadcasting, my dear Mr. Bayes, you are a little behind the times.

If you are a commercial operator and the crowd aboard is desirous of press, what are you going to do to get it? If you are a "pirate" you may steal it from WCC if he is not too weak to copy, or you might steal it from GBL's paid press, or you can copy his CQ, all of which is wholly about the British Parliament. Luckily in good weather



(i) An ideal crystal reseiver.
(2) A perfect wave trap.
(3) A powerful super amplifier.
As a crystal receiver the X-L THREE WAY is unexcelled for selectivity, volume and simplicity of control.
As a wave trap the X-L THREE WAY will eliminate interference between local and distance stations.
As a super-amplifier the X-L THREE WAY when used with any super-heterophy will greatly increase volume on distant stations.

Price \$8.75 POSTAGE PREPAID
Ask Your Dealer or Write us Direct.

Manufactured by
X-L RADIO COMPANY
1623 So. Verment Les Angeles, Cal.



RADIO EUREKA RADIO DIAL POINTER

30 Church Street, New York, N. Y

y your set by installing the Eureka Dial Point-fou save eyestrain and eliminate guesswork in your stations. A jewelry product made by manufacturers.

10c. Each SCREWS TO PANEL Pat. Pend.



POL. ISHED NICKEL (Gilt if desired.)

Obtain at your dealers or send 10c in stamps for each sample desired. Responsible jobbers wanted. Big Salos, Exclusive designs solicited for set manufacturers. Mfd. by C. W. BUTTS, Inc. 44 Hedden Place East Orange, N. J.

JUST OUT—NEW

Catalogue on Hetro Magnetic Daylight Distance Receivers

SIDBENEL RADIO MFG. CO. 29 W. Mt. Eden Ave. New York, N. Y.



Insure your copy reaching you each month. Subscribe to RADIO NEWS—\$2.50 a year. Experimenter Publishing Co., 53 Park Pl., N.Y.C.

we can copy American stations all the way across and thus get the news of the world.

NBA can be copied all the way to England
if there isn't too much QRM. In good
weather NAA can be copied nearly all the

way over.

If the British postoffice is as efficient as Mr. Bayes claims, why does it not pull down the antiquated spark stations and erect a tew modern tube transmitters to take the place of GCK, GLD, GNI, GNF and others which are nothing more nor less than rock crushers. Where, in Europe, is there a station at all comparable to WSC or WIM? Where, at all comparable to WSC or WIM? Where, in Europe, is there a station that can compare to WCC for quick and efficient handling of commercial traffic? Where are your stations which compare to the new WSH or KS? I might also mention KPH and KOK, WNU, WAX and a host of other notable American stations which are equipment with background stations. ped with modern apparatus and handle much long distance communication. Mr. Bayes, your stations are far behind any of these. British stations are using the old spark transmitters in a locality where interference is the worst of any place on earth. If the G. P. O. had any desire to improve the situation in the Channel, it would or should begin on the spark transmitters.

The latest Marconi spark transmitter is equipped with a spark coil for an emergency apparatus, the most inefficient and unreliaapparatus, the most methicient and unreliable piece of mechanism used in radio. It uses the transmitting inductance as part of the receiving set. I visited a British vessel where one of these had recently been installed and was told that it was one of Marconi's latest in sparks. Mr. Bayes claims that British apparatus can be compared to American and demands the receiving set I offered to give him if he could honestly say that British commercial radio apparatus was equal to American. He tells me in December Radio News that he will accept a Super-

Heterodyne.

I was rather surprised to read what Mr. Bayes said in his December letter to your magazine, but was most astonishingly surprised by his requesting an American Super-Heterodyne. After writing several letters to your magazine criticizing American methods and claiming British goods were superior, he makes known to you and your host of readers that he would like to have an American receiving set. I offered to give him this set out of my own funds without his having to prove, only to assert, that British commercial radio sets were comparable to American. I would just as soon have purchased a British or Dutch set, using some of those "good" dollar tubes which he praises so highly, instead of annoying him with a 10-tube Super-Heterodyne. I can't understand why he chose an American when Brit-ish are equal, if not actually superior, to the American sets, as he claims. It may per-haps be that he is "talking through his hat" and doesn't mean exactly what he says. At any rate, I have enjoyed the discussion and will assure him that I have no peeve against the British, simply because they are a little behind the times.

FRED M. Howe, Radio Operator S.S. Emidio, San Pedro, Calif.

Push-Pull Amplifiers with Standard Parts

(Continued from page 2095)

Practically no current flows through the grid circuits of the tupes, so the potential meter method of getting the mid-point begrid circuits of the tubes, so the potentiotween the two grids is available. This potentiometer is made up of two half-meg-



makes any circuit better!" I have had built an 8-tube Super-Heterodyne and of course

bought with care the best parts the market offered. The result was, I tried several well-known condensers which were not satisfactory and by chance tried a pair of "Mar-co Condensers" and was greatly pleased with the performance of my set. So much so I hoped to pick up one of the foreign stations during test week.

On tuning in on 470 meters, picked up "Lyons, France, Station PTT," which came in as loud and clear as a bell with orchested unsic, and held them until they signed off at 12 midnight, Eastern Standard Time.

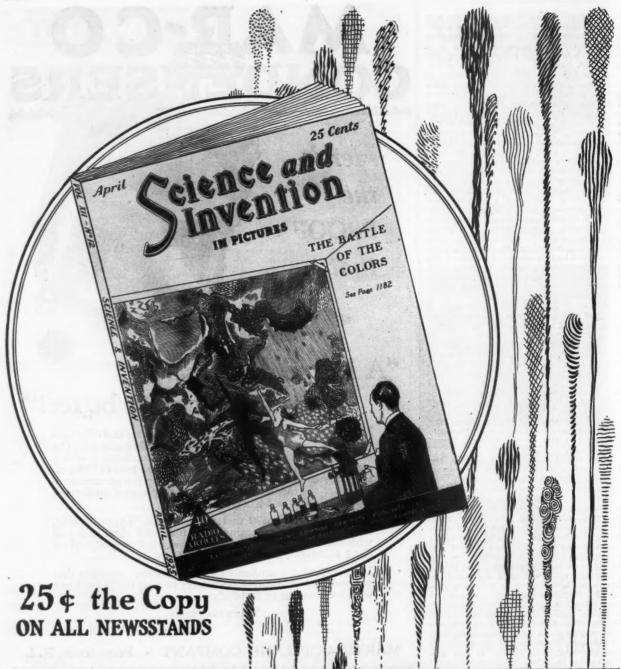
I am enclosing a confirmed telegram of my reception that you may know Mar-co Condensers proved 100% on a test with an amateur at the dials.

Yours very truly,

(Signed) H. W. DAHL

MARTIN-COPELAND COMPANY · Providence, R. I.





The Battle of the Colors

One of the most brilliant effects that has ever been produced on a screen is presented in a New York play. This remarkable new chemical optical effect is produced in the following manner: A light from an incandescent bulb or other source is concentrated through lenses and reflected by mirrors in conjunction with a small container that is filled with water, mixtures of analine dyes and some oily vehicle are ejected from syringes to the surface of this water.

These dyes when freshly prepared do not mix with each other but perform weird gyrations on the surface of the water, thus producing a veritable battle of colors on the screen.

This novel and interesting effect is but one of the thousands of odd scientific developments explained in the April issue of SCIENCE AND INVENTION. Ask your news dealer to let you see a copy the next time you pass his stand.

The Experimenter Publishing Co., Inc.
53 PARK PLACE
NEW YORK, N. Y.

ohm grid leaks connected in series, their outer ends connected to the two grids, and their junction to the — terminal of the "C" battery and through the latter to the filaments. The secondary of any good audio transformer is connected to the two grids, and the trick is done.

If you look at the windings of a head receiver or of any loud speaker of the iron diaphragm type which has two coils, you will see that the coils are connected by a little soldered pigtail. This is the mid-point of the whole winding, and it can be used in just the same way as the mid-tap of an out-put transformer. Connect it to the positive end of the "B" battery, the plate of one tube to the end of one coil and the plate of the other tube to the end of the other coil. Current will flow from the battery through one coil to the plate of one tube, and in so doing, will aid, let us say, the permanent magnet in creating a magnetic pull on the diaphragm. Current will also flow from the battery through the other coil to the plate of the other tube, but this time it will oppose the permanent magnetism. Suppose that the audio wave makes the first grid more positive; more current will flow through the first coil, and increase its assistance to the permanent magnet of the speaker. Result: more pull on the diaphragm; it moves toward the magnets. At the same instant, the second tube's grid becomes more negative; less current flows through its coil, and its opposition lessens. Result: again more pull on the diaphragm. So the loud speaker coils cause the outputs of the two tubes to add up their energy and give louder signals.

LOUD SPEAKER CONNECTIONS

It has just been said wat the steady flow "B" battery current in one coil opposes the magnetic effect of the current in the other. The two effects are equal and oppo-site, and hence cannot demagnetize the permanent magnet. This is a danger in the usual amplifier connection (speaker in series with battery and plate) which calls for care in connecting the proper speaker terminal to the battery lead. There is no "proper" terminal in this new hook-up; either terminal goes to either plate, and the battery goes to the connection between the two coils.

This hook-up may be used with any loud speaker which has two coils in the voice circuit. In some cases, where the inter-coil lead is covered with braid, a little delicacy is needed to remove the braid without cacy is needed to remove the braid without cutting the wire. The writer has found that an old safety razor blade, broken obliquely to give a sharp corner, is ideal for the job. After carefully slitting the insulation, it is pulled back and the wire inside served with a drop of solder from a soldering iron. Then a piece of stranded soldering iron. Then a piece of stranded wire is soldered on, and led to a terminal, whence a lead is taken to the + 90-volt terminal of the set.

To compare this method with one of the standard two-transformer circuits, the writer built it up, as shown in the photo-graph. The parts were those which happened to be on hand and are evident when recourse is made to the diagram.

For test purposes, a Neutrodyne receiver was used whose last stage was a push-pull amplifier using a pair of well-known transformers. A two-circuit jack just ahead of this stage allowed the output of the first The same tubes, filament current, and "B" battery were used in each amplifier. The battery were used in each amplifier. The same loud speaker was used. When on the regular amplifier, the extra lead was left dead. No difference in tone quality or volume could be noticed between the two circuits, yet the second represented a saving of at least \$5, and several square inches of valuable back-of-panel space.

ADIRONDACK MAGNETIC

Wave length range, 150 to 675 meters. Takes in new regulation wave length for super broadcasting stations.

Tube arrangements: Magnetic coil, equalizer, amplifier, detector, two stages audio.



THE WORLD'S GREATEST FIVE TUBE RECEIVER

For those that care to purchase a complete outfit, we have combined the following accessories, together with the instrument, at this exceptional low price.

- Adirondack Receiver Adirondack Lond Speaker
- 1 Complete Aerial
 1 Lightning Arrester
 1 P. R. Peerless Phones
- 5 Tested Tubes, 201A 2 45 Volt Batteries

Special Price as described

\$82.50

GENERAL INFORMATION

GENERAL INFORMATION

Antenna: Single wire 10 to 150 feet. Wire used satisfactory on indoor aerial.

Tubes: Dry cells, 199, or Storage Battery 201A.

Panel: 7 by 26, beautifully engraved.

Dials: 4 inch.

Controls: Germania, Hetro Magnetic.

Condensers: Foreign type, low loss.

Sockets: Special type.

Cabinet: Beautifully finished 8 by 27 solid mahogany piano, hinged, \$7.00 extra.

Sold On Trial

Look over very carefully every ad in this magazine and then you may read this one. Our story is simple.

Our story is simple.

This receiver is sold to you on a 10 day trial. You have the privilege to compare it with any \$150.00 to \$200.00 Receiver, and if it does not give as good or better results in distance, volume and clarity, you may return it to us in good condition without any obligation, and we will refund to you your money.

Furthermore if anyone in

Furthermore, if anyone in your locality. or you, can build so fine an instrument, using the same high grade parts as used in this instrument, for less money, you still have the same privilege to return it.

to return it.

The fact that the World famous Hetro Magnetic circuit is used, further description to its ability for transcontinental reception is not necessary.

We recently secured a li-cense and have adopted a pol-icy to sell direct to the con-sumer, avoiding the middle-man's profit.

Factories producing Hetro-Magnetic Receivers are months behind in production. Grasp this opportunity at once.

Adirondack Mountain Service Company

1582 Inwood Avenue New York City U. S. A.

Adirondack Mt. Service Co., Dept. NR5
1582 Inwood Ave., New York City, N. Y.
Please send me the outfit I have marked.
It is understood that I have 10 days in which
to try the set and if found not as advertised.
I will return the set and you will refund my
money.

 □ Adirondack Set alone
 \$37.50

 □ With Mahogany Cabinet
 44.50

 □ Adirondack Set complete
 82.50





Radio"Trouble Shooter Every Set Builder Should Own One



Easily Slips in Pocket. Generates its Own E.M.F. Fits Any Phone Tip.

ENGINEERS ARE ENTHUSED Say its wonderful. Lasts practically indefinitely.

Price \$1.25 With complete instructions. Send for one TODAY.

Absolutely simple in Operation. Wonderful time saver.

saver.

ADBRO MFG. CO.

Pittsburgh, Pa

Burns PERFECT REPRODUCER

Tone loud and pleasing. Hand-some material and design. Black—\$22.50 Shell—\$25.00 AMERICAN ELECTRIC CO.
State and 64th Sts. Chicago



Insure your copy reaching you each month. Subscribe to Radio News-\$2.50 a year Experimenter Publishing Co., 53 Park Place, N. Y. C.



WHY PAY \$10.00

or more to have an aerial spoil the appearance of your home? Antenella eliminates all unsightly wiring, lightning arresters, etc., and precludes the possibility of dangerous groundings on a power line. It also stops "canary bird" re-radiation from nearby oscillating sets from interfering.

ANTENELLA

is not only a real distance getter, but also successfully overcomes static annoyances.

At your dealers, otherwise send purchase price and you will be supplied without further charge.

(has Freshman 6. Inc. FRESHMAN BUILDING 240-248 West 40th Street, New York





Liberty Transformer Co., Inc. 555 N. Parkside Ave., Chicago



Insure your copy reaching you each month. Subscribe to RADIO NEWS—\$2.50 a year. Experimenter Publishing Co., 53 Park Pl., N.Y.C.

In conclusion, it might be well to add that a push-pull amplifier will not "show its stuff" unless the tubes are worked hard. This means 130 volts of "B" battery and nine volts of "C" battery. If you can get enough volume without distortion with 90 volts, or less, of "B" and a 4½-volt "C" battery, probably the conventional single tube will answer for the last stage. But even so, people are coming more and more to realize that a liberal margin of load capacity is just as desirable in a radio set as in an automobile, and they are more and more willing to ensure good quality by providing

The Most Selective Set

(Continued from page 2078)

quency amplification using this method of coupling can be used, although the circuit must of necessity contain numerous controls. It is most desirable, however, to use the circuit of Fig. 2, with no further alterations, since exceptionally good results may be had with it.

The Life and Work of Lee DeForest

(Continued from page 2067)

papers announced over the signature of the Marconi Company that Mr. White had done nothing of the sort.

DeForest, as usual, had paid a great deal more attention to the development of the art than he had to the development of his personal fortune, so when the crash came he was almost as badly off financially as he was back in the hard days of 1901 and before.

He saw this, but failed to take it into

serious consideration when he learned of the management of the company and of the methods it was beginning to employ for obtaining more money to tide them over the crisis. Instead of making his plans with care and attempting to salvage what rightfully belonged to him, he simply got himself wrought up with righteous anger, went into Mr. White's office, read the proverbial riot act, offered his resignation and then began to talk settlement. He asked for a license under all patents already assigned to the company, a quit claim deed to those in the process of granting and development and one thousand dollars in cash. The directors through Mr. White, their president, did not at first see their way clear to grant the cash portion of the settlement, but a little pursuasion on DeForest's part brought them to his point of view.

But hard luck seldom travels alone. De-Forest retained a lawyer, one C. C. Higgins, to draw up the final papers, including the assignments and the claims. The company assignments and the claims. In ecompany paid him the money and turned over the cash to him, taking his receipt on behalf of his client. Then he came to DeForest, handed over the papers and \$500. DeForest asked about the remainder of the cash and the attorney said it had been retained as his fee!

FOR more than a year previously DeForest I had been coquetting with the idea of a wireless telephone. While in the company and actively engaged in the technical super-vision of all its stations and plants he had had little time for work of this nature. as soon as he had severed relations with them and was free again to carry on his researches unmolested, he dived headlong into the solution of his newest problem—the construction of a wireless telephone.

The three-electrode tube was almost fully

brings you this genuine AMPL-TONE Loud Speaker Unit

Ten days free trial. Your Three Dollars unconditionally returned if at the end of ten days you are not perfectly satisfied with this Phonograph

Attachment and do not find it to be of exceptional value for volume and clear re production.

Reverse the

Reverse the tips and note the difference in pitch. Will not de-magnetize. Phonograph people spent years perfecting the acoustic. Take advantage and use our unit on your phonograph.

UNION FABRIC CO. (Makers of the French Headset) DERBY, CONN.



('ushion your Set!

Stop tube vibration! Prevent set from marring furniture! Used under set or tube shelf. Made of pure woo! felt. Set of 4 Radiofeet, including attaching screws or washers sent postpaid anywhere in the United States or Canada for \$1.00. Do not send stamps. Specify dark red(mahogany) or brown(oak) color.

NEODYNE ASSOCIATES 3121 Benenson Building
165 BROADWAY, NEW YORK

Young Men-

Turn Your Spare Hours Into Money!

Earn big profits, prizes, and awards selling RADIO NEWS, SCIENCE & INENTION, The EXPERIMENTER, and MO-TOR CAMPER & TOURIST in your neighborhood. We train you as our salesmen and pay you liberally for your time. Write at once and we will help you get started.

M. BRIDWELL.

THE EXPERIMENTER PUBLISHING CO.

53 Park Place, New York City

One Radio Book Everyone Reads



The Radio Broadcast Listener's Book of Information and Log Record

is not only a complete, practical book of those essential Radio facts that everyone who owns a radio should know, but it is also a handy log record for those who want to keep a record of the stations they receive. The book is enclosed in a handsome two-color cover, bound in Loose-leaf fashion, so that new pages can be inserted if necessary. It contains 80 pages, each one containing information more valuable than the last.

The following is a brief summary of the information contained in this book:

Information for the Broadcast Listener: Vacuum Tube Table: Meter Wave Lengths: Radio Batteries: Wireless Code Chart: Station Log Chart:

Complete list of Broadcast Stations of the United States, giving Power, wave length, and Time of Operation each day of the week. Log Sheets for tabulating the dial settings of the stations you receive on your radio. Size of Book, 6 in. by 9 in., with handsome 2color cover.



Published by

The E. I. COMPANY

Sole Distributors

The Consrad Co.
233 Fulton Street
New York, N. Y.

developed for the time and so spared him time on those investigations.

The first attempt was made with the Poulsen arc. As all know, the chief trouble with an arc transmitter is to make it function efficiently on the shorter wave-lengths.

the constructed an arc, and after much time and worry had been spent in making it work on the wave-lengths generally in use, he began the long search for the most effective method of modulating the continuous—or undamped, as it was called then—output of the oscillator. Of course, the oscillating characteristics of the audion were not known at this time.

While in the midst of these researches he was, one day, in conference with D. McFarlan Moore, a savant in the construction of lighting devices and vacuum tubes, when Mr. Moore called Mr. DeForest's attention to an account in one of Nikola Tesla's books dealing with the operation of an arc in the flame of a gas light and its extreme efficiency and stability. DeForest decided immediately that possibly this would produce some results in the new wireless telephone he was then engaged in perfecting. Accordingly, when the conference was completed, DeForest rushed back to his new laboratory in the Parker Building—whence he had moved when he left the old DeForest Company—and proceeded to build the Tesla apparatus and attempt to modulate it. The results were much better than he expected at first.

He had tried the straight Poulsen are, the arc in hydrogen and a number of adaptations made for the sake of keeping the arc steady and in oscillation. The new method proved the best of the lot.

Having found a way of producing undamped oscillations, he started work on adapting the modulator. He found with the new system that the most efficient location for it was in the ground lead of the antenna circuit.

It was on the last day of the year that the first speech was transmitted across his laboratory. December 31, 1906

atory, December 31, 1906.

After once having proved to himself that he was correct in his belief that telephony was entirely possible by wireless, he applied himself to the task with redoubled effort. The laboratory apparatus was of course bulky and heavy, hardly adaptable to commercial installation. So he set out to make its work practicable, that is, of sufficient strength and dependability for a commercial installation and to put it into a form which would be simple and rugged. Accordingly, he set about to find the proper form for the completed set.

The result was in the form of two cases with panels on top. In this form, they were made available to the public. The first installation of them was on a Lackawanna ferry boat on the Hudson River.

THE FERRY

One fine day in the latter part of May, 1907, the skipper of the Bergen received the surprise of his life when three men boarded his vessal, walked straight up the companion leading to the wheel-house deck, and did not even stop there. They went so far as to traverse his own sacred domain; they went directly into the fore wheel-house without knocking! Once inside, they dumped the bags—they looked suspiciously like plumbers' kits—on the floor unceremoniously, turned about and went below after another load.

Now, Hell itself has no fury like a ferry skipper whose dignity has been violated. So when DeForest and his assistants returned with the remainder of their apparatus to install the first moving wireless telephone station, the skipper treated them to some choice deep sea language, ending it with a lesson in sea etiquette.

It was not long, however, before they had installed a small generator in the engine room, connected it to the boiler and run the

WESTON

-the Radio plug that defies imitation



Be sure and get a Genuine Weston Instant-Change Plug for your radio set. You cannot go wrong if you look closely at the illustration above. It is exact.

The Weston Plug is the original automatic radio plug. Many others are imitations.

It is light and easy to grip, and interchangeable from headphones to loudspeaker in two seconds. Just shove cables in to connect, press triggers to pull cables out. No tools are required. There is no inconvenience or lost time.

We ston Instant-Change Radio Plugs are for sale by all reliable dealers and at most musical instrument stores. If your dealer cannot supply you, write direct to us.

Write for Circular J, a booklet that gives complete information on how to get better results from your set,

WESTON ELECTRICAL INSTRUMENT CORPORATION

173 Weston Avenue, Newark, N.J.

Offices in All Principal Cities





SAVE \$1.25 ON COST OF NEW TUBES BY HAVING YOUR OLD TUBES REBUILT AT \$1.75 EACH

Guaranteed equal to new. Send us your tubes by parcel post. We return them parcel post, C. O. D. and try to maintain 24 hour service.

HARVARD RADIO LABORATORIES

200 Old Colony Avenue South Boston, Mass.

Insure your copy reaching you each month. Subscribe to Radio News-\$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

April 1925



STATION 3BQ

Bon Hill, Victoria, Australia

The cover illustration, as shown here, is of a well known amateur short wave station. This is amateur station 3BQ, Bon Hill, Victoria, Australia, which has worked many U. S. A. and English amateur stations. The transmitter is supplied with 1500 volts through an electrolytic rectifier consisting of 104 jars. The tube is a Phillips Z4 operated at a normal plate current of 100 milliamperes. The serial is a 50-foot five wire cage type suspended between two 80-foot masts. The remarkable work accomplished by this station and many similar stations throughout the world should stimulate the interest of our readers in amateur radio.

THE EXPERIMENTER

25 Cents

Over 100,000 Copies

Radio for the "Amateur"

The EXPERIMENTER concentrates its entire radio pages to the problems of the radio amateur, covering the real, practical problems of the day that affect the actual transmission and receiving apparatus of the Amateur Station.

The special feature of the April issue, shown on this page, is the complete construction and operation, in detail, of a practical short wave receiver.

The EXPERIMENTER is carried by all Newsstands. You can obtain a copy of the latest issue today.

THE GERMOTT PUBLISHING CO., Owners

Licensed Publishers, THE EXPERIMENTER PUBLISHING CO., Inc., 53 Park Place, New York

How Radio Received



BOOK NO. II

By R. S. OULD of the Bureau of Standards of the U.S. Government

This new book of the E. I. Co. tells thoroughly and completely just how radio is received. How the radio waves originate, are sent out into space and finally received on the antenna and telephones. It enables you to understand the principles of the reception of the voices and music you receive daily out of the air.

This is one of the handiest of the E. I. Co. books for the ama-teur radio listener. It explains in a very clear way how Radio is transmitted and received. It contains 64 pages, size is 5 x 8 inches and is bound with a stiff cardboard cover and printed in two colors.



On Sale At All Radio and **News Dealers** PRICE 25c

NO

Published by THE E. I. COMPANY

The Consrad Company Sole Distributors 233 Fulton St., New York, N. Y. output wires to the cabin. The antenna was strung between the flag poles atop the ferry boat and the station was put into operation in the fore wheel-house.

The Lackawanna had erected a land station at the Hoboken terminal of the ferry and another at Twenty-third Street, Manhattan. These stations were put into operation, an operator installed on the ferry and the newspaper men invited to look over the works.

Communication was easy; the ferry station had ample power and the land stations were fairly pouring current into their antenna. The following Sunday the papers came out with full page spreads telling of the latest great advance of science, the radio telephone.

Incidentally, the skipper's feelings were assuaged when he saw the papers and saw his own photograph in spick and span uniform enjoying the place befitting a staunch

"Black Listening is Theft"

(Continued from page 2045)

an obnoxious tax. Of course, it must be said that in the United States such a tax would be well nigh impossible, whereas in Europe the public has been educated to heavy taxes and gracefully submits to them as a rule.

RADIO NEWS has no interest in the matter except that it sincerely believes that if the ether is free for all, radio can expand in a normal manner. And if that happens, within less than twenty years people over the entire world will be able to converse freely with each other and will then be able to understand each other, which they do not today. And once nations understand each other, wars will become only a remote possibility.

An Efficient Crystal Detector

(Continued from page 2082)

inch short. F is now mounted in position, with the two No. 6 R.H. brass screws one inch long. Place the camshaft bearing M in position under the arm A at the end near the crystal cup, put the cam and shaft in place, arranging M so that it will be about is inch from the end of the arm A. Clamp M in place and mark its position. Drill and countersink the base for a 6/32 clearance and bore and tap the block M for the same size thread. M may now be fastened to the base. Replace the camshaft and so fit the base. Replace the camsnart and so fit the knob N that there is no end play in the system. The base is drilled for the fastening screws of the two binding posts which are placed an inch apart in the positions

The strip C with its needle guide and spring is attached to the arm A with the 4-36 screw K, placing a washer under C and one under the head of the screw. Under this same screw K is fastened the flexible lead P from the left-hand binding post. Place the crystal cup in position and mark. Drill and tap for a 6/32 screw. Countersink the hole in the cup for the flat-headed screw. Before screwing the cup in place, cut a strip of thin copper or brass 1/4 of an inch wide equal in length to the distance be-



Radio Cabinets Strong and Rigid. Remember That We Pay Mail and Express Charges. It Makes Quite a Difference When Comparing Prices.

Specifications

Hardwood, rubbed mahogany finish. Top hinged, ends of top spleined to prevent warping.

	l size	Depth	Price
7 x	14	10	\$3.00
7 x	18	10	3.25
7 x	21	10	3.50
7 x	24	10	3.75
7 x	26	10	4.50
7 x	27	9	5.00
7 x	28	10	6.00

Mail and express prepaid east of Mississippi River We also make Radio Desks and Tables Send for free catalogue

Mail and express prepaid east of Mississippi River.

We also make Radio Desks and Tables.

Send for free catalogue

The Southern Toy Company, Inc. HICKORY, N. C.



ARVELOUS new Indian Prince-the Personal Motor-goes 90 to 100 miles on a gallon. Operates at less than 1/3c per mile. Light-Safe-Clean, You learn to mile. Light—Sare—Clean, 100 learn to ride it in 5 minutes. Costs less than any other high-grade machine. Write today for illustrated booklet telling, all about this new Indian Prince—the Personal Motor—and how easily you can buy it.

Indian Motocycle Co.



"Masterola Console"

The Radio Sensation

A five tube distance getter in a beautiful console cabinet that beautifies the home. Complete with Loud Speaker \$90

THE R. C. MILLS RADIO CORP. 303 Fourth Avenue New York City



PATENTS

DON'T LOSE YOUR RIGHTS
Before disclosing your invention to
anyone send for free blank form
"EVIDENCE OF CONCEPTION"
to be signed and witnessed, INE
Reg. Price Attys. In U. S. and Canda
270 Ouray Bide, Washinston, D. C.
Originators of the form "Evidence
of Concention"

R

Little Things That Improve Receiving

You will like the extreme care given to every detail in the manufacture as well as the correct and original design and construction which superior tinguish



AXLEY Approved Radio

It is this care with the little refinements

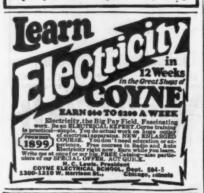
at is this care with the little refinements, the result of years of experience in the manuequipment, which improve your receiving when you use Yaxley products.

you use Yaxley products.

Take the Yaxley Jack as an example. The single nut mounting without the use of spacer washers is a distinct advantage to you. The phosphor bronze springs, the pure silver, self-cleaning contact rivets and other exclusive features, mean better satisfaction.

Your dealer will gladly show you these standard jacks or we will send you full information, if you write.

Yaxley Mfg. Company Dept. N, 217 No. Desplaines St., Chicago



We Want to Bid On Your Cabinet Needs

Our experience in this line is your guarantee of satisfaction. We can furnish proof. Ample space; drying room and paint room as large as many factories.

as many factories.

Speed, service and price will meet your approval. This is the time to send specifications or sample for bid, as prices on materials are at lowest point they will reach this year. About 50% of capacity contracted now; will not contract beyond capacity. First come, best served.

Universal Cabinet Co. Radio Avenue Greenville, Ohio



MARVELOUS NEW AUDIO TRANSFORMER



tween the crystal cup and the nearest bind-ing post. This strip is screwed under the cup and binding post and acts as a connection between the two. It is necessary that the screw holding the crystal cup fit tightly in the base, otherwise the cup might be loosened when it is rotated to bring a new portion of the crystal under the needle. The flexible lead P is then secured under the other binding post.

To place the phonograph needle (which should be a long one) in its spring holder, insert it from the top, point downwards until its top is flush with the top of the small diameter of the spring. If the spring has been wound according to the above instruc-tions, it will be found that the small diameter of the spring rests on the top of the needle guide and so allows the needle to be pushed into position without injuring pushed into position without injuring the spring. When replacing the needle, which should be done frequently, pull the needle out by the point with a pair of pliers; never pull it back up through the guide. It will ruin the spring if this is done. The spring should be stretched slightly so that there is a small amount of travel downwards, thus giving the needle the flexible action referred. giving the needle the floating action referred to above

The felt is then glued to the base. together with the method of holding and adjusting the needle makes a crystal detector that is not easily jarred out of adjustment.

Radio in 1935

(Continued from page 2051)

LOUD SPEAKERS

As long as telephone receivers were good enough to listen-in to radio, some little headway was made in making receivers more sensitive for faint sounds, but suddenly the public demanded loud speakers. Up to that time not a great amount of original research work along these lines had been done. So our good old friends, the telephone receivers, were pressed into service, to fill a duty for which they were not at all suited. Filling one's ear with music by means of a small telephone receiver is one thing, and filling a room full of music from the same sort of a receiver is a totally different problem. Naturally, our present-day loud speakers, which have as their basis the telephone receiver principle, are all faulty and have helped, more than anything else, to bring radio into disfavor, due to their squawking and unnatural nasal sounds. In other words, the loud speaker today is the weakest part of a radio receiving set. The few loud speakers made which do not work on telephone receiver principles are, as a rule, much superior, but even the present-day loud speakers are not what we shall use in 1935. As a matter of fact, the writer predicts with certainty that anything that has a small iron diaphragm, as have 90 per cent. of the loud speakers today, will not be used in 1935.

Imagine what happens to the small iron disc, measuring 21/8 inches in diameter, when called upon to reproduce transmitted sounds from a 50-piece orchestra. This little dia-phragm has to be drum, violin, saxophone, oboe, flute, trombone, 'cello, cornet and piano all at the same time. Manifestly, it is impossible to get the one diaphragm to vibrate in such a fashion as to produce not only all the tone values, but all of the overtones simultaneously. As a matter of fact, it never happens. All we do get is an "aver-age" of these sounds. Hence the distortion, and squawky reproduction.

and squawky reproduction.

The loud speaker of 1935 will not have a diaphragm at all. On our front cover the writer has pictured a talking, gaseous lamp, the sounds emanating from the glass walls of the luminous body of the lamp. This is not a wild prediction either, because it can be done this very giving the Parce News be done this very minute. In RADIO NEWS



Here's the Best and Safest Guide—while building your New Super-Heterodyne

Consrad pattern No. 13 gives the have designed the most complete and practical pattern ever originated for the Standard Super-heterodyne.

Contains 2 extra large blueprints 19½ by 44 inches and a 16-page instruction book. Everything is simplified, complete and ready for use.

Price \$1.00

SOLD BY ALL RADIO AND NEWS DEALERS

The Consrad Company 233 Fulton Street • New York City



Not Too Little Resistance To Overdrain the Battery

Not Too Much Resistance To Give Meaningless High Readings

No. 35 Voltmeter

A new pocket voltmeter for "B" Battery voltage measurement. Will show voltage of 5 units of "B" Battery, 22½ volt dry or 24 volt wet. 0-120 volt scale, 5 volt divisions. Price \$3.50. Other types pocket voltmeters, ammeters and voltammeters and Panel Meters.

The Sterling Manufacturing Co., Dept. H, Cleveland, Ohio







24-30 S. Clinton St.

Insure your copy reaching you each month. Subscribe to RADIO NEWS \$2.50 a year. Experimenter Publishing Co., 53 Park Place, New York City.



takes care of tube current better than any expert operator could regulate it. No more expert operator could regulater. No ince-hand rheostats or filament meters neces-sary. Bringsthemost out of each individual tube automatically. Simplifies wiring, dou-bles tube life, lowers set cost. Approved by all leading laboratories. Used in every popular construction circuit.

RADIALL COMPANY Dept. RN 10,50 Franklin St., New York City



'MIRACLE' SUPER-POWERFUL AND SELECTIVE CRYSTAL SET

Gives you choice of stations without interference.
You Buy Direct from Migr. & Originator Factory Prices Good material, workmanship, handsome cabinet and engraved panel. \$12.75 for set. \$18.50 with \$6.00 phones and aerial outfit.

Sold Under a 10-Day Trial. If Not Satisfactory Return and Full Amount Paid Will Be Refunded.



No tubes or batteries. Always ready for use Simple to operate. Nothing to get out of order. No howls or other disagreeable noises.

Sent Express Collect UNCLE AL'S RADIO SHOP 3015 Dakota Street, Oakland, Calif.



The Bosch NoBattry is a device which enables anyone to obtain from an electric light socket perfect and ample plate roitage for radio vacuum tubes. It takes the place of all 'B' batteries and is decidedly more efficient, reliable, convenient and economical—correspondence in tited. AMER. BOSCH MAGNETO CORP., Springneded. Mass.

To the Radio Dealer

Let us explain how you can make the sale of our publications a worth while, well paying part of your busi-ness. Write now and prepare for the Fall and Winter trade.

Experimenter Publishing Company New York City Laboratories we have made 110-volt incan-Laboratories we have made 10 to the descent lamps speak and sing—and everybody has heard of the singing arc lamp. In without the same dianhragms used. Then neither of these are diaphragms used. Then there is also the Peukert Talking Dynamo principle, as pictured in these pages. Here we have a wire wound upon a steel magnet which, when mounted upon a resonant base, becomes a wonderful loud speaker. The effect here is had through molecular action. No diaphragm is used here either. These are only a few principles. There may be many more which have as yet not been discovered. But you may rest assured that in 1935 you will not be able to tell the difference between the singer's voice when singing over the radio and actually hearing her on the stage. The chances are, in fact, that you will hear her better by radio than from the stage, because if the transmission is perfect, you will be only a few feet away from the loud speaker, whereas in the theatre you may be 100 or more feet away from the singer.

THE SATURATION POINT

It is altogether probable that in 1935 the saturation point of radio will have been apsaturation point of radio will have been approached. By that time anywhere from 25 to 35 million radio receiving outfits will be in operation in the United States. In putting down this figure, the writer has, of course, borne in mind that the population of the United States within 10 years will be greatly in excess of what it is now.

Rather than decreasing, the number of radio broadcast stations will probably keep on increasing during the pext few years.

on increasing during the next few years. At that time we shall also have moving broadcast stations, as, for instance, stations on board ships, stations on board airships and airplanes, for commercial and semicommercial purposes. Every rich man's automobile will have its radio transmission and receiving station to enable him to keep in direct touch with his office.

As the writer mentioned at the start of this article, all of the views expressed herein are very conservative. The chances are overwhelming that progress will be a great deal faster and a great deal more wonderful than the few predictions made in these pages would indicate.

A Noiseless Intermediate **Amplifier**

(Continued from page 2079)

However, since the trap circuit is tuned exactly to the intermediate frequency which it is desired to pass, an infinite resistance is created and the desired signal prefers rather to travel on toward the grid of the next Thus it is seen that all the extraneous currents traveling along with the signal on account of the broadness in tuning of the first circuit or due to other causes, are eliminated, thus making the set much more selective.

The same line of action is repeated in the second resistance stage. The last two are of the usual transformer coupled type and are standard in every way. These are followed by the second detector and two audio stages.

Constructed in RADIO NEWS Laboratories, the set was found to work very well indeed. The only trouble encountered was in tuning the trap circuits, which was more tedium than actual trouble.

A glance at the photographs will at once show the proper method of arranging the parts on the baseboard. As the set is hardly one to be advised to the beginner, it is pictured here in the experimental stages. Though it may seem complicated, the man who has built a few of his own will encounter nothing in the present one to give him forebodings.





The Royalty of Radie Tubes
A powerful and durable tube that will greatly improve reception, increase range and volume with a maximum of clearness.
Our direct sales plan enables you concluded to the control of the con

PATENTS WRITE for our Four Guide Books and "REC-ORD OF INVENTION BLANK" before disclosing inventions. Send model or sketch and description of your inven-tion for our INSPECTION and INSTRUC-TIONS FREE. TERMS REASONABLE. Electrical and Radio Cases a specialty

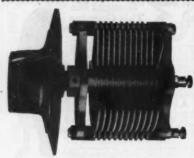
VICTOR J. EVANS & CO. 919 NINTH ST., WASHINGTON, D. C.



The set with the air telephone directory A Year Ahead

The Dayton Fan & Motor Company DAYTON, OHIO





SET BUILDERS **GET THIS!**

If you are building neutrodynes, radio frequency circuits, or using hook-ups of any sort where simplified condenser tuning is important, just stop right now and investigate the

One Knob Low Loss Vernier Condenser

Here is a condenser that eliminates the preliminary adjustment of the vernier plate before definite logging is possible. Vernier plate lines up with group plates at zero and operates as one of them. Vernier adjustment is then made by turning upper half of knob in the opposite

For Balancing Circuits

you can't equal the Proudfoot. A single hole cut in your panel and one lock nut firmly secures the condenser at the most effective working angle. There are no spoiled panels because of incorrectly mounted condensers.

Other Important Features

of the Proudfoot are two-rod stator plate mounting, metal end plates, bronze bearings, and dissimilar metals at friction points. See the Proudfoot today. If your dealer hasn't one, write us for detailed circular. Made in four sizes and priced right.

With Vernier Without Vernier M. F. C. Dial and Kneb Dial and Kneb 0.0025 83.75 \$3.25 0.0025 4.40 3.90 4.00 0.001 3.75 5.25

CRUVER MANUFACTURING CO.

2456 W. Jackson Blvd.,

Chicago, Ill.



The detector and oscillator are of the standard type. The tuning coil A may be made by winding 64 turns of No. 18 S.C.C. wire on a 3-inch tube. The condensers F and E are both of the .0005 variety and are variable. The pick-up coil D may consist of 10 turns of No. 18 wound at the end of the oscillator inductance tube which is of the oscillator inductance tube, which is also three inches in diameter. The plate also three inches in diameter. The plate and grid coils B and C for the oscillator may consist of 40 turns for the former and 64 for the latter, separated about half an inch from each other, on the tube.

Fifty kilocycles were selected as the best

intermediate frequency at which to amplify, so of course it will be necessary to purchase three transformers designed for that frequency. And here it might not be amiss to note that, for the sake of efficiency, it is probably better to purchase these instruments than to attempt constructing them.

The condenser C₁ is used to tune the transformer secondary and if it is necessary, the manufacturer of the instrument will furnish a notation with it as to the proper value for this capacity.

The resistance R_1 is of 25,000 ohms value and is fixed. Since it is not in the least critical, any resistance which will fall within 20 per cent. of its rated value will suffice. The trap circuit consists of a 400-turn honeycomb coil shunted with a .001 variable con-

The resistances R₃ may be of about three megohms if the 199 or 299 type tubes are used. It will be noted from the photographs that this form of tube was used in the experiment. There was no mechanical or electrical reason for their use, however, and the 201A or 301A might serve as well.

In the hook-up no audio frequency shown. Any type amplifier may be added at the output posts or incorporated in the set.

Latest Radio Patents

(Continued from page 2107)

formers and particularly to arrangements of this kind used in wave or wireless transmission sys-

kind used in wave or wireless transmission systems.

This arrangement of the kind described comprises an oscillation producer, a wave radiator, a frequency multiplying transformer, a primary circuit including the oscillation producer and the primary of the transformer, a secondary circuit including a coil of the transformer, a disturbance elimination circuit, a coupling of variable effect between the secondary circuit and the disturbance of elimination circuit, and another coupling of variable effect between the disturbance elimination circuit and the wave radiator.

History of Radio Inventions

(Continued from page 2049)

In the same month Guglielmo Marconi In the same month Guglielmo Marconi filed an application for a patent on an invention whereby "electrical actions or manifestations are transmitted through the air, earth or water by means of electric oscillations of high frequency." The provisional specification which accompanied the application deals chiefly with modifications in the cation dealt chiefly with modifications in the Ruhmkorff coil, the coherer and coherer circuits, and associated tapper. For the "greatest possible distance" of communication, it recommended the use of reflectors at the transmitter and receiver.

In September, Nikola Tesla filed an application for a British patent on "Improvements relating to the Production, Regulation ments relating to the Production, Regulation and Utilization of Electric Currents of High Frequency, and to Apparatus therefor," the latter of which included the synchronous rotary discharger. The application was accepted on November 21, whereupon was disclosed a method of producing radio frequency oscillations, which was the most approved for 20 years. (Br. Pat. 20,981/96.)

Note.—In this year, also, Professor C. W. Röntgen discovered the X-rays.

Röntgen discovered the X-rays.

(To be continued)



Magic Radio Clearness

with this new principle hornthe Kellogg Symphony Reproducer

Brings in the marvels of the air exactly as broadcast.

Embodies a new principle-the result of years of experiment by our experts. Made by the 28-year old Kellogg Switch-board & Supply Company—specialists in the transmission of sound. Improves any set it's used on.

Hear It Today

Today, hear the Kellogg Symphony. Do not buy any lesser horn until you have heard it. It will increase the value of your set 100% in musical quality—in pleasure to your family and yourself. Any dealer will gladly demonstrate the Symphony for you. Hear it-today!

KELLOGG SWITCHBOARD & SUPPLY CO. CHICAGO, ILLINOIS

Radio Builders! write for

this free booklet-Tells why over 45 leading set manufacturers use Pacent Radio Essentials in their sets—

Why these essentials insure better reception and greater efficiency for your radio set— Describes the complete Pacent It's free. Simply dash off a

PACENT ELECTRIC COMPANY, Inc. 91 Seventh Avent New York City San Francisco Washington Minneapolis Birmingham Philadelphia

R. H. White Radio Co., Hamilton, Ont. DE DONT IMPROVISE - PACENTIZE

INCLUDING 5 MATCHED

AND TESTED TUBES CHISHOLM-BARFIELD CORP.

206 Broadway, New York City Insure your copy reaching you each month. Subscribe to RADIO NEWS — \$2.50 a year. Experimenter Publishing Co., 53 Park Pl., N.Y.C.



BURIED TREASURE

can still be found in

CHEMISTRY



What Some of Our Students Say of This

I have not written since I received the big set. I can still say that it far exceeded my anticipations. Since I have been studying with your school I have been appointed chemist for the Scranton Coal Co. testing all the coal and ash by proximate analysis. The lessons are helping me wonderfully, and the interesting patiently like they are written makes me wait. ENS.

ENS.

I wish to express my appreciation of your prompt reply to my letter and to the recommendation to the General Electric Co. I intend to start the student engineering course at the works. This is somewhat along electrical lines, but the fact that I had a recommendation from a reliable school no doubt had continue that the start of the sta

Joh.—H. VAN BENTRIUYSEN.
So far I've been more than pleased with your course and am still doing nicely. I hope to be your honor graduate this year.—J. M. NORKUS, JR.

NORKUS, JR.

I find your course excellent and your instruction, truthfully, the clearest and best assembled I have ever taken, and yours is the fifth one I've studied.—JAMES J. KELLY.

From the time I was having Chemistry it has never been thus explained to me as it is now. I am recommending you highly to my friends, and urging them to become members of such an organization.—CHARLES BENJAMIN.

JAMIN.

I shall always recommend your school to my friends and let them know how simple your lessons are.—C. J. AMDAHL.

I am more than pleased. You dig right in from the start, I am going to get somewhere with this course. I am no glad that I found you.—A. A. CAMERON.

I use your lessons constantly as I find it more thorough than most text books I can secure.—WM. H. TIBIS.

Thanking you for your lessons, which I find not only drear and concise, but wonderfully interesting. I am—ROBT. H. TRAYLOR.

I received employment in the Consolidated Gas. Co. I appreciate very much the good service of the school when a recommendation was asked for.—JOS. DECKER.

Course:

Good Chemists Command High Salaries



A.B., A.M., LL.D., Ph.D.

A.B., A.M., LL.D., Ph.D.

Noted Instructor, Lecturer and Author. Formerly Treasurer American Chemical Society and a practical chemist with many well known achievements to his credit. Not only has Dr. Sloane taught chemistry for years but he was for many years, engaged in commercial chemistry work.

and you can make yourself independent for life by unearthing one of chemistry's vet undiscovered secrets.

Do you remember how the tales of pirate gold used to fire your imagination and make you want to sail the uncharted seas in search of treasure and adventure? And then you would regret that such things were no longer done. But that is a mistake. They are done—today and everyday—not on desert islands, but in the chemical laboratories throughout your own country. Quietly, systematically, the chemist works. His work is difficult, but more adventurous than the blood-curdling deeds of the Spanish Main. Instead of meeting an early and violent death on some forgotten shore, he gathers wealth and honor through his invaluable contributions to hu-manity. Alfred Nobel, the Swedish chemist who invented dynamite, made so many millions that the income alone from his bequests provides five \$40,000 prizes every year for the advancement of science and peace. C. M. Hall, the chemist who discovered how to manufacture aluminum made millions through this discovery. F. G. Cottrell, who devised a valuable process for recovering the waste from flue gases, James Gayley, who showed how to save enormous losses in steel manufacture, L. H. Baekeland, who invented Bakelite—these are only a few of the men to whom fortunes have come through their chemical achievements.



Experimental Equipment Furnished to Every Student

We give to every student without additional charge this chemical equipment, including forty-nine pleess of laboratory apparatus and supplies, and forly different chemicals and reagents. These comprise the apparatus and chemicals used for the experimental took apparatus and chemicals used for the experimental took the course. The fitted heavy wooden box serves not only as a case for the outfit but also as a useful laboratory accessory for performing countless experiments.

CHEMICAL INSTITUTE OF NEW YORK, Inc.

HOME EXTENSION DIVISION 5

NEW YORK CITY SS.R-WEST BROADWAY

Now Is the Time to Study Chemistry

Not only are there boundless opportunities for amassing wealth in Chemistry, but the profession affords congenial employment at good salaries to hundreds of thousands who merely follow out its present applications. These applications are innumerable, touching intimately every business and every product in the world. The work of the chemist can hardity be called work at all. It is the keenest and most enjoyable kind of plessure. The days in a chemical laboratory are filled with thilling and delightful experimentation, with the alluring prospect of a discovery that may spell Fortune always at hand to spur your enthusiasm.

You Can Learn at Home

To qualify for this remarkable calling requires elaborate specialized training. Formerly it was necessary to attend a university for several years to acquire that training, but thanks to our highly perfected and thorough system of instruction, you can now stay at home, keep your position, and let us educate you in Chemistry during your spare time. Even with only common schooling you can take our course and equip yourself for immediate practical work in a chemical laboratory. Dr. Sloane gives every one of his students the same careful, personal supervision that made him celebrated throughout his long career as a college professor. Your instruction from the very beginning is made interesting and practical, and we supply you with apparatus and chemicals for performing the faschating analyses and experimental with apparatus and chemicals for performing the faschating analyses and experimental forms the state of the course.

66-8. No. CHEMICAL INSTITUTE OF NEW YORK Home Extension Division 5 66-R-West Broadway New York City

You don't have to have even the small price of the course to start. You can pay for it in small monthly amounts—so small that you won't feel them.

The cost of our course is very low, and includes everything, even the chemistry outflowers to extra to buy with our course. Our plan to commit the cost of our course is very low, and includes everything, even the form the cost of the committee of the course of the committee of the committee of the course **Easy Monthly Payments**

Special 30 Day Offer Besides turnishing the student with his Experimental Equipment, we are making an additional special offer for a short while only. You owe it to yourself to find out about it. Write today for full information and free book "Opportunities for Chemists." Send the coupon right now while it is fresh in your mind. Or just write your name and address on a postal and mail it to us. But whatever you do, act today before this offer is withdrawn.

DON'T WAIT—MAIL COUPON NOW! NAME ADDRESS

CITY..... STATE..... STATE.....

OPPORTUNITY AD-LETS

Follow these advertisements every month. Reliable advertisers from all over the country offer their most attractive specials in these columns.

Classified advertising rate twenty-two cents a word for each insertion. Ten per cent discount for 6 issues, 20 per cent discount for 12 issues. Name and address must be included at the above rate. Cash should accompany all classified advertisements unless placed by an accredited advertising agency. No advertisement for less than 10 words accepted.

Objectionable or misleading advertisements not accepted. Advertisements for the July issue must reach us not later than May 1st.

CIRCULATION LARGER THAN THAT OF ANY OTHER RADIO PUBLICATION

EXPERIMENTER PUBLISHING CO., INC., 53 Park Place, New York, N. Y.

Agents Wanted

Agents Wanted in every city and town to seil standard radio apparatus. Attractive discounts given. If interested write us at once stating age and radio experience. Wilmington Electrical Specialty Co., Inc., 405 Delaware &ve., Wilmington, Delaware.

Agents—Write for Free Samples. Bell Madison "Better-Made" Shirts for large Manufacturer direct to wearer. No capital or experience required. Many earn \$100 weekly and bonus. Madison Mills, 591 Broadway, New York.

Big Meney and fast cales. Every owner buys gold initials for his auto. You charge \$1.50; make \$1.35. Ten orders daily easy. Write for particulars and free samples. American Monogram Co., Dept. 138, East Orange, N. J.

Guaranteed Genuine Gold Leaf Letters anyone can put or store windows. Large profits, enormous demand. Fresamples. Metallic Letter Co., 422 N. Clark, Chicago.

Asents—500% profit, "Happy Home Maker Shampoo" builds your own big business. Martin of Indiana made 875.00 in one day. Missouri man made 875.00 in one month. Exclusive territory. Geo. A. Schmidt & Co., 256A West North Ave., Chicago.

Can You Sell? All-wool, union made, tailored-to-mess ure suits for \$19.75. Universal Tailors, K99 Bedfore Street, Boston.

Agents—Signs for stores and offices. Entirely new. \$50 week easily made. World Signs, P186 W. Washington Chicago.

Big mency and fast sales, every owner buys gold initials for his auto. You charge \$1.50 make \$1.44 profit. 10 orders daily eas. Samples and information free. World Monogram Co., Dept. 27, Newark, N. J.

Free Book, Start your own little Mail Order business. Pier, 911 Cortland St., New York.

Man wanted for this territory to self wonderful value Men's, Women's, Children's Shoes direct, asving wearer over 40 per cerif. Experience unnecessary. Samples supplied. Big weekly permanent income. Write today. Tanners Mg. Co., 900-3 C St., Botton, Mans.

Big Maney Selling New Household Cleaning Set. Washes and drien windows. Sweeps, scrubs, mops. All complete only \$2.95. Over half profit. Write Harper Brush Works, 160 3rd Street, Fairfield, Iowa.

Agents Wanted Full or Part Time to Sell on liberal commission new Thermostatic Automatic Carburetor control Attachment for Ford cars. Increases mileage 100%. No holes to drill. Attached in 2 minutes. Does automatically exactly what Ford Manual instructs driver do by hand. Cadillac now using Thermostatic Carburetor Control under Blancke Heenes. Write at once. A. C. Blancke & Co., Dept. 191A, 602 W. Lake St., Chicago.

Business Opportunities

Make \$100 Weekly in Spare Time. Sell what the public wants—long distance radio receiving sets. Two sales weekly pays \$100 profit. No big investment, no carvassing. Sharpe of Colorado made \$955 in one month. Representatives wanted at once. This plan is aweeling the country—write today before your county is gone. Ozarks, \$13 Washington Bivd., Chicago.

Advertise, hundred magazines, three issues, 10e word. Pennell Company, Covington, Kentucky.

Free Beeklet, How to Become Successful in Real Estate. Macdonald Cooperative Realty, San Diego, California.

Would You Buy a profitable radio supply business for 5.00 to \$25.00. We tell you and show you how to start one. Enclose 25e for samples and instructions. Co-operative Merchandiss Company, Chelses, Mass.

Are you willing to make money? I blaze the way. Act quick. Send \$2.00 for sample. Konkle, 102 Market St., Newark, N. J.

Financing—Will negotiate with new enterprise, individual or established business needing capital—incorporation attended to. Suite 808-10, 63 Wall St., N. Y.

Chemistry

Learn Chemistry at home. Dr. T. O'Conor Sloane, noted educator and acientific authority will teach you. Our home study correspondence course fits you to take a position as chemist. See our full page ad on page 2189 of this issue. Chemical Institute of New York, 66 W. Broadway, New York.

Educational

Used Correspondence School courses save over half. Barrain catalogue 1000 courses free. Used courses bought. Students' Exchange, Dept. A. 47 West 42d St., New York,

Educational (Continued)

Cerrespendence Courses. All Schools. Lowest prices. Terms. Catalog free. Mention subject. Economy Educator Service, 440-F Sansome, San Francisco.

Esperanto

Esperanto Books, Special for Radio News readers studying Esperanto—You need the excellent little Edinburch Dictionary—8,75. Clothbound grammar and Dictionary combined \$1,50. Lames Denson Sayers, Box 223, City Hall Station, New York.

Persons who have learned or contemplate learning an international language or who are interested in getting the best professional information on all phases of the subject, will receive an agreeable surprise and will hear something to their interest by addressing: The International Institute, P. O. Box 1529, Washington, D. C.

Esperants. Easiest and most successful method for studying the Esperanto Language ever published. Booklet of sample pages illustrated by 145 illustrations sent on request. Benson School of Esperanto, Inc., 20 Mercer St., Newark, N. J.

For Advertisers

24 Words-355 Rural Weeklies \$14.20. Admeyer, 4112-R Hartford, St. Louis,

For Sale

Typewriter—Cost \$100, will sell for \$35. Carnegle College, Bogers, Ohio.

For Sale—Why bother with dry cells? Build an everlasting "Hawley" storage "B" Battery of the nickeliron type. No frying or hissing, clearer reception and greater volume. Put up in both knock-down units and assembled types. Requires no soldering or former exhibiting the parts to build the following alses: 90 voits \$8.95; 100 voits \$8.95; 100 voits \$8.95; 120 voits \$11.60; 135 voits \$12.75; 150 voits \$13.95; 120 voits \$11.60; par guarantee with 30 day trial offer with return of your money without any fits por ands. Sample cell 35c prepaid. 8 page illustrated folder of instructions containing simple means of piete manufactured charger \$2.75. Order direct or write for my literature, guarantee and testimonials. Same day shipments. Address B. R. Smith, 31 Washington Ave..

(New) Esse 1000 v. 500 watt M.G. \$100. A. Mopre, Portland, Mich.

1 Tube Eria, 2 Tube Harkness. Upton, Lafargeville, New York.

Health

Free—Stop using tobacco. We will give free information how to conquer habit easily and permanently. Results guaranteed. Anti-Tobacco League, Box M. Omaha, Neb.

Help Wanted

All Men. Women, Beys. Girls, 1? to 65 willing to accept Government Positions \$117-\$250 traveling or stationary; Write Mr. Ozment, 251, St. Louis, Mo., immediately.

Detectives Needed Everywhere, Travel. Experience unnecessary. Write George Wagner, former Government Detective, 1968 Broadway, N. Y.

Earn \$25 weekly, spare time, writing for newspapers, magazines. Experience unnecessary. Copyright book free. Press Syndicate, 972, St. Louis, Mo.

Men te build radie sets in spare time. Leon Lambert, 595-H Kaufman Bldg., Wichita, Kansas.

Detectives needed everywhere; large salaries; free particulars; write National Headquarters, 183 East 79th, New York.

Man Wanted (city or country) old established company will supply capital and start you in your own permanent business selling necessities people must buy every day. Experience unnecessary. Write McConnon & Co., Factory Mic., Wilnon, Minn.

Home Study Courses

Correspondence Courses bought and sold. Hanfling, R-799
Broadway, New York.

Insects Wanted

Why not spend Spring, Summer and Fall gathering butterflies, insects? I buy hundreds of kinds for collections. Some worth \$1 to \$7 each. Simple outdoor work with my instructions, pictures, price-list. Send 10 cents (not stamps) for my illustrated Prospectus before sending butterflies. Mr. Sinclair, Dealter in Insects, Box 1424, Dept. 40, San Diego, California.

Instruction

Lears Chemistry at Heme. Dr. T. O'Conor Sloane, noted educator and scientific authority, will teach you. Our home study correspondence course fits you to take a position as chemist. See our full page ad on page 2189 of this issue. Chemical Institute of New York, 66 W. Broadway, New York City.

Double Entry Bookkeeping mastered in 60 hours; guaranteed; diplomas. International Bookkeeping Institute, Dept. 28, Springfield, Missouri.

Miscellaneous

Beautiful registered bull pups cheap. Bulldogs, 501 Rockwood, Dallas, Texas.

Free Kataleg Kian Jewelry, Sample Kluxer pocketplece with big moneymaking plan 10c. Morris, Box 1174-RN, Omaha, Nebr.

Motorcycles. Bicycles

Den't Buy a Bieyele Moter Attachment until you get our catalog and prices. Shaw Mfg. Co., Dept. 6, Galesburg, Kansas.

Musical Instruments

(Patent Pending) Wander dellar instrument, anybody play, eversbody surprised. Imitate orchestra, become professional entertainer; other valuable informations. Multitone, 448 F. West 38th, New York.

News Correspondents

Earn \$25 weekly, spare time, writing for newspapers, magazines. Experience unnecessary. Copyright book free. Press Syndicate, 973, St. Louis, Mo.

Old Money Wanted

\$2 to \$500 each paid for hundreds of Old or Odd Coins. Keep all old money, it may be very valuable. Send 10c for New Tilustrated Coin Value Book, 48c. Guaranteed prices. Get posted. We pay Cash. Clarke Coin Company, 14 Street, LeRoy, N. Y.

Patent Attorneys

lavesters—Should write for our Free Guide Books and "Record of Invention Blank" before disclosing inventions. Send model or sketch of your invention for our Free Inspections and Instructions. Radio, Electrical, Chemical, Mechanical and Trademark experts. Ferms reasonable. Victor J. Evans & Ca., 922 Ninth, Washington, D. C.

Patents. Send drawing or model for examination and report as to patentability. Advice and booklet free. High-ext references. Best results. Promptuses assured. Watson E. Coleman, Patent Lawyer, 644 G Street, N W... Washington, D. C.

Patents—Send for form "Evidence of Conception" to be signed and witnessed. Form, fee schedule, information free. Lancaster and Allwine. Registered Patent Attorneys in United States and Canada, 269 Ouray Bidg., Washington, D. C.

Patents for inventions, Long experience, highest grade work, rates reasonable, best references. Advice as to natentability. Wm. Ashley Kelly, 41 Park Row, New York.

inventers who derive largest profits know and heed certain simple but vital facts before applying for patents. Our book Patent-Sense gives those facts; free. Write Lacey & Lacey. 631 F St., Washington, D. C. Established 1889.

Patents

inventions Commercialized. Patented or unpatented. Write Adam Fisher Mfg. Ca., 278 Enright, St. Louis, Mo.

Uspatented ideas Can Be Seld. I tell you how and he're you make the sale. Free particulars (Conyrighted), Write W. T. Greene, 804 Jenifer Building, Washington, D. C.

Your signature (12 styles), finest you have ever seen. end quarter, Meub, Expert Penman, 2365 Mar Vista, Send quarter, 2 Pasadena, Calif.

Personal

Lonely Hearts—Exchange letters; make interesting net friends in our joily club. Eva Moore, Box 908, Jacksonville Florida. Enclose stamp.

Lonely-Join Our Club. Make friends everywhere. Par-ticulars free. Write Mrs. Matthews, Box 26, Oakland, Calif.

Printing

Personal Stationery. Beautifully monogrammed 50 cents ox, 3 \$1. Stamp for samples. Eagle Co., 86 Road, tichmond Hill, New York.

Printing Outfits and Supplies

Print your own eards, stationery, circulars, paper, etc. Complete outfits \$8.85; Job Presses \$12, \$35; Rotary \$150. Print for others, big profit. All easy, rules sent. Write for catalog presses, type, paper, etc. Press Company, A-13, Meriden, Conn.

Save Money by building your own "B" Storage Battery.
Batteries may be built at home for voltages from 20 to 200 volts. Sample Cell with complete instructions 25c.
Co-Operative Merchandise Company, Chelses, Mass.

Total Calena Crystals 50c pound in bulk. Buskett,

Tested Galena Crystals 50e pound in bulk.

Joplin, Mo.

Boys! Den't Overlook This. The "Raseo" Baby Detector. Greatest detector ever brought out with molded base. Fully adjustable. See former advertisements in this publication, or our catalog. Detector with Galena Crystal, complete 50c, the same detector with Radiocite Crystal, 75c prepaid. Send for yours today. Radio Specialty Company, 96-98 Park Place, New York City.

Ivery Radio Panel: Grained white "Iverylite" makes most beautiful set of all. Guaranteed satisfactory. Any size 3-16" thick sent prepaid 3c per square inch. Sample free E. P. Haltom, Dept. N. 614 Main St., Fort Worth, Texas.

Attention!—50 Vacuum tube hook-ups. The greatest collession of vacuum tube circuits ever brought under two covers at such insignificant cost. These diagrams will be found in the great "Rasco" catalog, which contains raw materials and parts in a greater profusion than any other catalog. 15c in stamps, or coin, will bring the catalog to you. Radio Specialty Co., 96-98 Park Place, New York

Free Tested Crsytal—Send no money, just two cent stamp or postage. Pitts Novelty Sales, 561 W.Washington St.

Neutrodyne Hunehbacks—Change that Neut, or build instead of a Neut, the Kladag Coast to Coast Circuit. Same panel same layout as Neut—fewer parts. Selective with deep, resonant volume. Not obtainable elsewhere. One different part, 22 feet gold buswire, lithographed print complete, simple instructions—prepaid anywhere—\$5.00. Nothing else to buy. Details—10c. 48 page parts catalog—10c. Stamps accepted, same as cash. Kladag Radio Laboratories, Kent, Ohio.

Edison Elements 5c per pair. Co-operative Merchandise o. Chelsea, Mass.

Reflectane—Smallest Loudspeaker in existence. Only five Inches high. Unusual tonal quality result of latest selentific development in sound reproduction. A beautiful ornament which will meet every requirement for amplified reception in your home. Adjustable unit guaranteed. Postpaid upon receipt of \$5. W. A. Dickson, 517 Lissner Bidg., 524 South Spring St., Los Angeles, Cal.

U. S. Navy Battery Dynamotors, 24/1500 volt. 233 ampere 6000 rpm, \$25. Belt drive \$3.00 additional. Holtzer-Cabet 12/500.07 ampere, \$18.00. Navy Keys with Blinker Light \$2.00 postpaid. Harry Klenzle, 501 East 84th Sturct, New York.

Complete airline Stadie Map with a movable mile scale ad up to date log. Price 50c. Dan Kennedy, Chrisand up to topher, Ill.

Magnet Wire. All kinds and sizes. No. 10 DCC 56c per lb., add 4c for each size up to No. 20. 100 ft. No. 12 Enameted aerial wire 90c. Silicon Transformer Steel cut to size, 26c per lb. 4 cubic inches to the pound. Cash with order. Morton Electric Co., 4832 Rice St., Chicago,

Neutrodyne 6 Tubes! 3 stages of audio frequency!
With our Blueprint and full instructions you can build
this set for less than \$50. Will reach California from
Maine on Loud-speaker. Plan also includes Dial-readings
of over 100 stations that you can locate on this set. Send
\$1 meney order for Blueprint together with instructions
and Dial readings. Radio Experimenter, 421 Cumberland
Ave., Fortland, Mains

Radio-(Continued)

One tube radio sets complete with tube, batteries and tones, \$17.50. Nangle Co., 601 Washington Boul., Oak Park. Ill.

Bargain quick sale, 8 tube Navy sending and receiving et, Western Electric Equipment. Room 801-38 Park Row, set, Western El New York City.

Experimental Electricity Course in 20 lessons. By S. Gernsback and H. W. Secor, E.E. A course of the theory ands practice of Electricity for the Experimenter. Every phase of experimental electricity is treated comprehensively in plain English. New experiments are described and explained and nearly every application of Electricity in modern life is given. 100 pages—400 illustrations. Flexible cloth cover, 75c, postpaid. Stiff cloth cover, \$1.25, postpaid. Experimenter Publishing Co., Book Dept., 52 Park Place, New York City.

The How and Why of Radie Apparatus, by H. W. Secor, E.E. This newest book on radio matters fulfills a distinct gap in wireless literature in that, while the treatment is made as understandable and as free from mathematics as possible, it at the same time incorporates a wealth of technique and instruction for the Radio Amateur—the Radio Operator—the Installation and Designing Expert—as well as teachers and students of the subject in general. A very broad field has been covered by the author, at the same time books. If you are engaged in any branch of the Radio or allied arts at all you will surely need this latest contribution to radio literature, which is destined to be found on every radio man's book shelf before long. A glance at the following list of chapters gives but a very seant idea of the extensive and useful radio knowledge provided in its text: The Induction Coli; The Alternating Current Transformer; Transmitting Inductances; Radio. Receiving Condensers; Detectors; Telephone Receivers; Radio Amplifiers; Construction of a Direct Reading Wavemeter and Decremeter; Antenna Construction; The Calculation and Measurement of Inductances; Appendix containing very usseful tables, covering all subjects treated in this very unusual book. This newest of Radio Works, cloth bound in vellum Science of the content of the conte

Boys-Big Money Every Month!

WE WANT LIVE BOYS IN EVERY TOWN TO ACT AS SALES AGENTS FOR RADIO NEWS, SCIENCE AND INVENTION. THE EXPERIMENTER, AND MOTOR CAMPER & TOURIST, GENEROUS PAY—EASY WORK, WRITE TODAY! M. BRIDWELL, EXPERIMENTER PUBLISHING COMPANY, 53 PARK PLACE, NEW YORK CITY.

Salesmen Wanted

A Salesman wanted in every town or city within 25 miles of a broadcasting station to sell Badiogem, the complete radio receiving set that retails for 25.56. With Radiogen there is nothing else to buy—the outfit includes the Radiogen receiving apparatus, 1,000 ohm phone, and aerial outfit. The cheapest radio outfit on the market—yet as practical at the most expensive. Big money to the right nem. Rend of an apple outfit. The Radiogem Corp., 66-R West Broadway, New York City.

Salesmen—Sell Four Square Suits, \$12.50; guaranteed two years. Five patterns. Profit in advance \$3 to \$5.50. Coat, vest, pants, riding pants. silp-ons. caps. Women's knickers. Jiffy Snap-ons. One day delivery. Stone-Field, BK2556 Wabash, Chicago.

Lightning strange battery compound. Charges discharged batteries instantly. Eliminates old method entirely. Gallon free to agents. Lightning Co., St. Paul, Minn.

Sell Guranteed shirts, Factory to wearer. Big commission paid in advance. We deliver. Make \$5.00-\$20.00 daily. Write for our "Wonder Sales Outfit." Curtis Shirt Co. 508 St. Wells, Dept. 20, Chicago.

Scenery to Rent

Settings for Opera, Plays, Minstrels. Plush Drops. Address Amelia Grain, Philadelphia.

Song Writers

Songwriters: Let me furnish the music for your songs, guaranteeing you absolute satisfaction. Copyrights secured, Submit your scripts for estimate and free advice. Walter W. Newcomer, 1674 Broadway, New York.

Telegraphy

Telegraphy—Both Morse and Wireless taught thoroughly. Big salaries. Wonderful opportunities. Expenses low; chance to earn part. School established fifty years. Catalog free. Dedge's Institute, Cour St., Valparaiso, Ind.

Wanted to Buy

Full Value Paid for Old Gold, Jeweiry, Watches, Diamonds, crowns, bridges, dental gold, silver, platinum, gold or silver ore; magneto points, old false toeth. Packages returned if our offer is not satisfactory. United States Smeling Works (The Old Reliable) 120 So. State St., Dept. 16, Chicago, Ill.



Make your set selective sep-Make your set selective—separate the interfering station by simply putting the Traffic Cop on guard. The Ferbend Wave Trap will tune out interfering local stations, no matter how troublesome. Never reduces, but nearly always increases volume. Designed and manufactured complete by us after years of careful experimenting. It is not to be confused with imitations, hastity asperimenting. It is not to be confused with imitations, hastity asperimenting. It is not to be confused with imitations, hastity asperimenting. It is not not be confused with imitations, hastity asperiments in the properties of the confused of the c

Send for FREE booklet FERBEND ELECTRIC CO. 25E, So. Water St., Chicago, Ill. Poughkeepsie N. Y. Gentlemen:
The Wave
Trap ordered
from you some
time ago is
all that you
claim for it
and the n
some.
It not only
keeps out the

other station that is caus-ing the inter-ference, but it also seems to act as a clarifier of the

===0000000

Wave Length Changes Don't Worry Radio Fans Using "Find-Me-Quick" Radio Chart!

Always up to date without additional cost, self-in-dexed, accurate, complete and permanent data CON-STANILY IN FULL VIEW OF OPERATOR. Indis-pensable for any kind of Radio Set, invaluable when completed.

pensable for any kind of Radio Set, invaluable when completed.

PRIGE 50e, POSTPAID

Printed on heavy, white ledger linen paper, size 22 x 11 Inches. Ellimination Wave-Length Tabulator with 600 classified Broadcasting Stations GIVEN WITH EACH CHART. Copyrights 1925. Patent Pending. ElliTone State With Each Other State Stat

Radio	Chart	Bureau,	Patterson	Bidg.,	Fresne,	Calif
Radio 8	Set Us	ed				
Send po	ostpaid			'Find-M	e-Quick''	Radi
Charts	and Ta	bulators,	for which	I enclose	\$	
in bill,	coin,	or mone;	y order.			R.N
Name .						
Address			· · · · · · · · · · · · · · · · · · ·	*****		

TUBES REPAIRED

All Work Done in Our Own Laboratory

We are not agents but own and operate a fully equipped tube factory magned by experienced tube experts. Our work is, therefore, suberior and you are certain of satisfaction. We guarantee to return genuine element to you. New glass bulb put on in every instance, insuring correct vacuum and proper "hardness" for the type of tube. Tubes returned parcel post C.O.D. Send yours in today.

CHICAGO ELECTRIC DEVICES COMPANY Established 1920. 70 E. 22nd St., Dept. 21. Chicago

"PACIFIC QUINTET"
Super Het Kit (45,000 Cycle)
Consisting of 1 Pacific "Ranger" No. 30 Oscillator Coupler, 3 Pacific "Ranger" No. 25 Intermediate Frequency Transformers and 1 Pacific No. 20 "Ranger" Filter Transformer with hook up print and simple Instructions.

tions.
Sent to any address upon receipt of \$15.00, or by
Parcel Post or Express C.O.D.
Representatives—Manufactures—Distributors
Baldwin Pacific & Co., 441 Pacific Bidg., San Francisco

The New PARAGON Radio Receivers Introducing the new non-radiating Paradyne Circuit, new simplified tuning, and new lew prices. Write for Folder ns-Morgan Co. Inc., 18 Alvin Ave . Upper Monthair, N.



An Exceptional Condenser

Like all Allen-Bradley Radio Devices, the Bradleydenser offers high efficiency and sharp tuning. Brass plates, soldered at all joints, and a new type of bearing insure low resistance and low losses. It is pronounced "a fine job" by radio engineers. If you want to see "an exceptional condenser", ask the Allen-Bradley dealer. guaranteed parts in his set. He knows that Allen-Bradley Radio Devices, such as the Bradleystat, Bradleyleak, Bradleyohm, Bradleydenser etc., provide noiseless control. He incorporates them into his new set for maximum selectivity, and he is not disappointed. The stepless, noiseless adjustment eliminates the harsh noises produced by inferior devices. Any Allen-Bradley dealer will gladly show you why Allen-Bradley Radio Devices increase selectivity. Stop in, today, and see the new line.







